A 10 YEAR RETROSPECTIVE STUDY OF THE NATIONAL REHABILITATION CENTER ABU DHABI: TRENDS, POPULATION CHARACTRESTICS, ASSOCIATIONS AND PREDICTORS OF TREATMENT OUTCOMES

By:

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Abstract

Substance use disorder (SUD) is a global problem with no boundaries. Harmful uses of drugs and alcohol have major impacts on public health. Data extracted from case notes of all NRC patients from February 2002 to August 2011were analyzed to obtain a descriptive profile and changes in trends during this period. The data were extracted manually using a template and entered into a spreadsheet for analysis. During the period under consideration only male patients were admitted to the NRC. Data were available on 591 patients to be included in the study. The results showed that the average age of the patients was 32.4 years, 42% were married, 44% were single and 13% were divorced. A very high percentage, 60%, was unemployed and 32% were employed or were students. Fifty-one percent% had not completed their secondary education, 33% had completed secondary education and 16% had post-secondary education. The main substance of abuse was alcohol (41%), followed by heroin (16%), marijuana (11%), Benzodiazepines (6%), inhalants (2%), amphetamines (2%). Other substances (20%) included prescription drugs, including. Painkillers such as Tramadol, Methadone, and codeine, sedatives such as Xanax and Valium, and substances such as Kemadrine, Artane and Khat amounted to 20%. Fifteen-percent of all patients tested positive for Hepatitis C, 2% positive for Hepatitis B and there we no reports of HIV. The presence of co-morbid psychiatric illnesses ranged from 9% to 25% depending on the substance of abuse.

The changes in trends in the main drugs of abuse as well as other analysis of patterns of use are reported. Comparisons of the findings with other studies in the region, implications of the findings, the limitations of the study, as well as areas for future research are discussed.

Dedication and Acknowledgements

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Table of Contents

My DrPH Thesis was the 3 manuscript option; The Study includes 5 chapters:

List of Tables

List of Figures

Chapter 1

Problem statement and literature review

Problem statement

Substance use disorder (SUD) is a global problem with no boundaries. Harmful uses of drugs and alcohol have major impacts on public health. It affects people and societies in many ways. Substance use is currently ranked as the third leading risk factor for disease and disability in the world. This harmful use of alcohol results in 3.3 million deaths each year. On average, every person in the world aged 15 years or older drinks 6.2 litters of pure alcohol per year. Less than half the population (38.3%) actually drinks alcohol, this means that those who do drink consume on average 17 litters of pure alcohol annually. At least 15.3 million persons have drug use disorders. Injecting drug use is reported in 148 countries, of which 120 report HIV infection among this population (http://www.who.int/substance_abuse/facts/en/index.html).

Alcohol is the world's third largest risk factor for premature mortality, disability and loss of health. Some 320,000 young people between the ages of 15 and 29 die from alcohol-related causes, accounting for 9% of all deaths in that age group (WHO,2013).

According to the World Health Organization (WHO), the harmful use of alcohol is a global problem compromising both individual and social development. It results in 2.5 million deaths each year. The problem of substance abuse disorders has become an area of interest worldwide. The United Nations Office on Drugs and Crime (UNODC, 2003) reported changes in the trends and patterns of substance abuse disorders. These trends constitute a younger age of onset, increased

prevalence of substance abuse disorders among females, and increased injection drug use (Hassan, 2009).

For drug use and its health consequences, it is estimated that one in 20 adults, or a quarter of a billion people between the ages of 15 and 64 years, used at least one drug in 2014. Over 29 million people who use drugs are estimated to suffer from drug use disorders.12 million of these 29 million people inject drugs, of which 14.0 per cent are living with HIV. The impact of drug use in terms of its consequences on health continues to be devastating. With an estimated 207,400 drug-related deaths in 2014, corresponding to 43.5 deaths per million people aged 15-64; the number of drug-related deaths worldwide has also remained stable. Overdose deaths contribute to about a third to a half of all drug-related deaths, most of which are attributable to opioids (UNODC report, 2016).

There is increasing concern about alcohol and drug problems in the Middle East. Despite cultural, social, religious, and strict legal prohibitions and punitive laws across Arabian countries, the problems of alcohol and substance misuse exist. It appears to be gradually more acknowledged, suggesting a rise in reporting (AlMarri and Oei, 2008).

The United Arab Emirates (UAE) is one of the Middle East countries in which drug abuse seems to be on the increase, raising concerns of it becoming a serious problem in the future. Many aspects of life have changed rapidly since the independence of the UAE in 1971. There are various opportunities for drug trafficking, given its geographical location, i.e., proximity to opiate-producing countries, long land borders and extensive international air connections.

The rapid population growth resulting in a predominately-young population, coupled with immense social change and accompanying stressors, highlight the importance and urgency of

exploring the substance abuse situation in the country and the identification of the needs for future research for both prevention and treatment (AlMarri and Oei, 2008).

Literature Review

A systematic review of the literature in English and Arabic languages was conducted by searching electronic databases (1980–2012) and conducting hand searches of Arab published journals. Only studies investigating alcohol and/or substance use or abuse issues with participants (1) of Arab nationality, (2) living in the Middle East country, and (3) of Muslim faith were included.

Although substance abuse transcends global borders (Weiss et al 1999), available literature from Arab countries is scarce. The majority of identified research dealt with adult male participants and the most commonly abused drugs were alcohol, heroin, and cannabis, among others.

Studies from the UAE

Data from the United Arab Emirates (UAE) region is limited. In the 2015, the National Rehabilitation Centre (NRC) conducted a cohort study about the pattern of substance use disorder in the United Arab Emirates in. In the cohort studied, SUD correlated with smoking and marital status. Poly-substance users formed the majority of the cohort (84.4 %) with various combinations of substances identified across different age groups. Opioid and alcohol were the most common substances used. The use of pharmaceutical opioids, primarily Tramadol (67.2 % of opioid users), was higher among the youngest age group studied (<30 years old), while older opioid users (≥30 years old) commonly used illicit opioids (Heroin). The use of prescribed medication for non-medical use also included Pregabalin (mean of 8.3 capsules ± 0.5 per day), Procyclidin (6.1 tablets

+ 0.6 per day) and Carisoprodol (4.2 tablets ± 0.4 per day) and was again highest in the age group below 30 years (Alblooshi, 2015).

The World Health Organization (Degendhart et al, 2010) attributes 5.3% of total deaths (15 957 000) to alcohol use and 0.4% to the consumption of illicit drugs. In the UAE, death rates are 111 per 100,000 in the age group between 15-49 years, and 140 per 100,000 in total population. It is approximated that 3.3% of the death rates in the UAE are due to drug use (Solomon et al, 2011) and 5.3% is the global estimate of mortality due to substance use.

A study compared patterns of substance abuse between 120 abusers from the Kingdom of Saudi Arabia (KSA) and 79 abusers from the UAE (Amir, 2001). All participants were males. Analysis of the data revealed some similarities including age, employment, and substances prevalent among poly-substance abusers. Differences in patterns of substance abuse included age at onset, prevalence of poly-substance abuse, and substances prevalent among single-substance abusers.

Another study showed that rapid social change in the UAE has reduced the influence of some of the social control measures such as the effect of the family structure, customs and traditions. The supportive role of the family in the new society has changed, and has been replaced in part by an expatriate work force. It was found that the large number of expatriate workers has influenced the spread of drug abuse among people in the UAE. Most of the expatriate workers come from drug producing countries such as Pakistan, Afghanistan, Iran, and India (Hashim, 1995).

The study showed that the rate of drug abuse among young men is high, especially the use of heroin. Drug abusers who are U.A.E citizens are more likely to be involved in drug abuse problems. Most of them are multi-drug abusers and they spend a lot of money on their drug use. Substances such as hashish, heroin, opium and barbiturates are the most common types of drugs,

which are on the increase in U.A.E. society. The lack of a comprehensive and unambiguous policy to combat drugs in U.A.E. is a significant factor behind the increase in problems of drug abuse in the U.A.E. Drug policy in the U.A.E. depends mainly on individual efforts and the commitment of some government organizations. These efforts are mainly concentrated in the law enforcement agencies in the Emirates and federal legislation is neither effective nor welcomed in the different Emirates (Hashim, 1995).

Studies from the Arabian Gulf Co-operative Countries (GCC)

Information about the current status of alcohol and substance abuse in the Arabian Gulf region was reviewed by AlMarri and Oei, 2008. They reported lower consumption rates compared to western countries. The scarcity of data in Muslim Arab societies, probably reflect the social, religious, and legal prohibition of these substances, including alcohol (Hafeiz, 1995; Okasha, 1985). Despite this, there is an increasing tendency towards increased consumption within the Middle East region (Zaidan et al., 2007).

A study from Saudi Arabia assessed trends among first time admissions to the specialized addiction treatment Amal Hospital of Dammam (Eastern Saudi Arabia) over its first two decades of its establishment (1986–2006). The main outcome measures were annual inception number (AIN), relative frequency of substances (RFS), relative frequency of drug combinations (RFDC), mean number of substances (MNS), and socio-demographic changes. 12,743 patients were

admitted between 1986 and 2006. The majority were aged 20–39 years (83%), never married (60%), and with low education (81%). In the second decade, subjects were significantly older and less likely unemployed than in the first decade (28.9 years versus 30.2 years; 27% versus 19% respectively). The mean AIN rose from 509 in the first decade to 765 in the second decade. In the same periods, the RFS increased for amphetamines and cannabis (from 12.1 and 17.5% to 48.1 and 46.5%, respectively), decreased for heroin, sedatives and volatile substances (from 15.1, and 6.1% to 22.5, 7.3, and 2.5%, respectively), and remained stable for alcohol (from 27.1 to 26.7%). The overall RFDC increased from 25.5 to 43.2% with significant pair-wise increases of cannabis/amphetamine, alcohol/cannabis and alcohol/amphetamine, and heroin/alcohol. The mean number of substances per subject increased from 1.32 to 1.56. The researchers concluded that significant shifts have occurred in the types and patterns of substances use among treatment-seeking subjects, underscoring the need for community-based epidemiologic studies and establishment of a comprehensive drug information system in Saudi Arabia (AbuMadini, 2008).

In Bahrain, a study examined the factors associated with immediate relapse among Bahraini heroin abusers (Dabas, 2001). Demographic characteristics and factors associated with immediate relapse to heroin use among 40 male Bahraini heroin abusers were studied one week after discharge from the Drug and Alcohol Rehabilitation Unit in Bahrain. The mean age of the patients was 32.7 years, the age at which drug abuse began ranged from 12 years to 31 years, and the age range of regular use was 15-37 years. More than half of the patients were single, unemployed, unskilled laborers with secondary-school education. The vast majority used heroin intravenously. The majority of the subjects saw negative emotional states and drug-related cues as influential in their immediate relapse after discharge. Findings suggest that the treatment and rehabilitation unit in Bahrain should look into the issues of after-care.

A comparative study of alcoholics and drug addicts conducted in Kuwait studied 110 male patients (aged 15-54 years) admitted to the alcohol and drug abuse unit of a Psychiatric Hospital in Kuwait. The sample consisted of three groups: alcohol abusers, drug abusers, and abusers of both substances. These three groups were compared for age, education, employment record, and psychiatric disorders, history of marital problems or parental dysfunction, and organic illness. Findings indicate a correlation between those who abused both types of substances and more severe psychopathological illnesses. Those who primarily abused drugs were younger, mainly single, had a higher level of education, and exhibited behavior that is more antisocial. The alcoholics were older, had a higher divorce rate, and demonstrated organic illness with their psychiatric disorder (Chaleby, 1986).

A cross-cultural study investigated the correlates of addiction-related problems in Kuwait. The Addiction Severity Index (ASI) was used to evaluate 120 hospitalized addicts in Kuwait's only addiction unit, categorized according to their primary drug of abuse. Findings revealed that 61% were alcoholics and 39% were drug addicts. Examination of ASI composite scores showed no difference between the two patient groups except in their corresponding problem area of substance abuse. ASI composite scores were similar to the interviewer's severity ratings. Inter-correlations between scores for different problem areas were low. The validity of ASI in diagnosing these problems was unquestionable, but the cross-cultural significance of some problem areas is doubtful (Bilal, 1988).

A study of alcoholism treatment was conducted in Kuwait. The outcome of a 5-year prospective follow-up study of 100 patients treated in Kuwait Hospital for alcohol-related problems was reported using two parameters computed from weighted follow-up variables, namely, Offset Scores measuring patients' initial follow-up status and Direction of Slope summarizing consequent

Follow-up Scores. Nineteen patients had died representing 14 times the age-corrected national Mortality rate. Univariate and multivariate analyses of outcome measures against pre-follow-up patients' characteristics revealed that variables indicating heavy alcohol use independently predicted negative outcome and mortality. The tendency of the group score distribution towards normalization was uninfluenced by treatment. The pertinence of these findings to the medical profession in Kuwait was stressed (Bilal, 1989).

A study in Kuwait addressed changing patterns of drug addiction. The socio-cultural considerations and persistence of indiscriminate prescription habits for addicts may have contributed to shifting patterns of misused drugs from traditional alcohol and illicit drugs to predominantly iatrogenic dependence on benzodiazepines. The clinical profiles and the rationale for the long-adopted detoxification treatment of 120 patients were studied. Multiple-drug misuses were found to suffer significantly more anxiety-type symptoms suggestive of benzodiazepine withdrawal. The observed poor correlation of detoxification medication with patient variables suggests that such treatment should be replaced by treatments based on proper physical and psychiatric evaluation (Bilal, 1989).

Studies from Other Arab & Middle Eastern Countries

A study from Lebanon (Karam, 2010) provided rapid situation assessment of the use of multiple substances in diverse segments of the Lebanese population. A multi-method and multi-sample approach was adopted collecting quantitative and qualitative data from the academic sector (high

school and university students), substance users on treatment or under arrest (prison, detention), and non-institutionalized "street" users.

Age of first substance use started as early as 9 years in the youth sample, 12% of high school students reported smoking one or more packs of cigarettes per day, and 9% of the university students met criteria for DSM-IV alcohol abuse. Cannabis represented the most commonly used illicit drug in both high school and university students, and tranquilizers were the most frequently misused medicinal substance. Heroin was responsible for 50% of the treatment admissions, followed by cocaine (20%), and alcohol (20%); heroin was also the most common substance among arrested subjects. Recidivism was nearly universal for heroin users across all treatment settings. Unperceived need for treatment was the most common reason for not seeking treatment in non-institutionalized drug users (47.6%). Injecting drug use was a common behavior noted within substance using populations in treatment and non-institutionalized subjects (about 50% of them), with a high rate of needle sharing practices. About half of all patients in treatment had a history of police arrests, and about one-third of those in prison ever received prior treatment for substance use. The study points towards a growing trend for substance use problems in early adolescence that warrants close monitoring

In Jordan, a study of trends in drug abuse associated fatalities was conducted between 2000 and 2004 (Hadidi, 2009). Postmortem forensic pathology reports for all autopsies examined in the National Institute of Forensic Medicine were reviewed over the 5-year period and drug abuse associated deaths were selected. The study revealed that 44 cases (0.76%) out of the 5789 total autopsies were attributed to drug abuse. The age ranged from 20 to 60 years (mean=32.7). More than 80% of cases were Jordanian males. The reported abused substances as single or in combination were alcohol in 56.8%, morphine 36.4%, heroin 15.9%, benzodiazepines and cocaine

11.4%. Surprisingly, a case neither with amphetamine or amphetamine analogue, nor with marijuana or methadone was recorded. In 75% of cases the death was accidental and only one case was reported to be suicidal, while in 18.2% and 4.5% of deaths were due to sudden death and road traffic accidents, respectively. Regarding the specific cause of death, it was related to drug overdose in 50% of cases, and in 34.1%, 11.4% and 4.5% of cases it was attributed to drug related medical complications, non-drug related complications, and trauma, respectively. Alcohol was mainly associated with accidental death; morphine and heroin were associated with drug overdose and abuse through intravenous route. Injection marks were reported in 56.8% of cases with 52.3% of the deaths occurring at home

Another exploratory study of drug-alcohol-dependence was conducted in Jordan (1970 - 1977) using indirect measurements or indicators and direct estimates of abuse in different localities. The study showed changing patterns and trends of abuse of illicit drugs (hashish and other opiates) and licit psychoactive drugs (mainly tranquilizers and barbiturates) obtained by prescription. The incidence of licit drug abuse has been rising steadily overtime. Drug abusers belong to a wide range of socio-economic backgrounds, occupations, and age groups (Daoud, 1980).

The situation in Egypt seems to be different. Substance abuse disorders have been monitored in Egypt since 1929, although mainly from a legal viewpoint. (ANGA annual report, 1993-2003) Previous Egyptian studies included surveys on substance use in selected populations of schools, universities, and factories (Soueif et al., 1992). They document high usage of cannabis and psychotropic agents. The use of other drugs, such as heroin and cocaine, was rare. Inhalant use was confined to the lower class. More recently, assessments of trends and patterns of drug abuse were carried out in five governorates of Egypt by the United Nations Office for Drug Control and Crime Prevention Regional Office of the Middle East and North Africa (UNODCP, 2001a, and

United Nations Office on Drugs and Crime (UNODC). Again, cannabis was reported as the preferred drug of choice, followed by alcohol (Hassan, 2009).

A study from Egypt described client characteristics and needs, while also pointing out gaps in treatment programs that need to be filled. Identifying common characteristics of treatment clients helps to better design assessment, treatment, and rehabilitation strategies. For two years, adult inpatient clients admitted to a private Egyptian hospital were systematically assessed for substance abuse (N=324). The clients were 91.4% male and 91.9% Muslim. Families supported 48.9% of the clients. Only 19.2% of the men and one woman were married. Cannabis (93.4%), alcohol (89.7%), psychotropic medications (80.9%), and heroin (78.4%) were the most common substances used recently. Anxiety (80.1%) and depression (77.4%) were common in the clients. The study highlights mental health problems and the family context of substance abuse treatment. It also underscores the few women receiving treatment and recommended improving access and reducing harm associated with substance use (Hassan, 2009).

In Iran, 2006, there were an estimated 200,000 injecting drug users (IDUs). Injecting drug use is a relatively new phenomenon in Iran, where opium smoking was the predominant form of drug use for hundreds of years. As in many countries experiencing a rise in injecting drug use, injection of drugs accounted for transmission of more than two-thirds of HIV infections. This qualitative study aimed to describe IDUs in Tehran, Iran's capital city; examined the injecting-related HIV risk behaviors of IDUs; and suggested necessary interventions to prevent HIV transmission among IDUs and their families and sex partners (Razzaghi, 2006).

The recent rise of heroin injection in Iran is strongly associated with HIV risk. Sharing injection instruments is a common and complex behavior among Iranian IDUs (Razzaghi, 2006).

A qualitative study from Southern Iran was conducted to explore the demographics of substance users in a rural area of Iran. Seventy-six semi-structured interviews were conducted with drug users who were referred to a treatment facility. Participants were primarily male (72/76), with a mean age of 28.4 years. The most commonly used drug was opium, followed by heroin, prescription medications, buprenorphine, and hashish. Over 91% of the respondents reported a history of illicit drug use in at least 1 family member. The first injection drug used was Buprenorphine at 55% (12/22) and heroin at 45% (10/22). The sources of needles were reported to be pharmacies, and close friends, 64% and 36% of the times, respectively. In addition, 64% of IDUs stated they shared needles in the last month (Jafari, 2008).

In summary, the above literature review demonstrates the paucity of published research on substance use and the lack of population studies showing the prevalence and high-risk population groups in this part of the world. Most of the available studies dealt with substance abusers in treatment or were conducted in selected population groups. Evidence for effectiveness of treatment, relapse rates, circumstances of use, and the quality of life of abusers are almost completely missing from the available literature in this region. Despite the limitations, available studies suggest an existing problem of substance use in the region, which is likely to be on the increase.

The present study

As data from this region is limited, efforts need to develop targeted prevention and intervention initiatives in the United Arab Emirates (UAE). Therefore, it was necessary to identify the nature of substance use by describing the characteristics of those using different substances. Consequently, this study in the UAE was conceived to describe the pattern of SUD from the years 2002 to 2011, and to explore the factors associated with treatment outcome, also to find the predictors of relapse, which was systematically recruited, from the country's National Rehabilitation Centre (NRC) in Abu Dhabi.

The present study is focused on systematic data collected from a clinical population in Abu Dhabi, UAE during the years 2002 until 2011. It is presented in the form of three papers. The first paper presents a descriptive analysis of the patient population giving a profile of men population who has received treatment at the National Rehabilitation Center Abu Dhabi over a 10-year period. The second paper looks at factors associated with good outcomes in this population. The third paper focus on factors predicting relapse.

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Chapter 2: Paper 1

Characteristics of National Rehabilitation Center (NRC) Patients in the UAE, a 10-year review (2002-2011)

Introduction & problem statement

Studying the characteristics of a clinical population is often the only way to obtain information on a health problem, particularly a hidden problem such as substance misuse. A household survey is one method for collecting epidemiological data on substance misuse but because of the difficulties in carrying out such surveys in cultures such as Arab societies, data on clinical populations are used instead to characterize the magnitude of the problem and identify high-risk groups. The few studies on the characteristics of substance users in the Middle East and Arabic countries have mostly been carried out using clinical populations.

The United Arab Emirates (UAE) comprises seven Emirates with a total population estimated at 8,264,070 as recorded by Population Statistics, of which only 11.4% are Emirati citizens and 88.6% are expatriates (Population Estimates 2006-2010). The Emirate of Abu Dhabi is the largest, with a total population of 2,422,400 as reported by the Health Authority - Abu Dhabi (HAAD) (Health Statistics 2011).

Literature review

Data in general on substance abuse from the United Arab Emirates (UAE) region is limited. In 2015 the National Rehabilitation Centre (NRC) conducted a cohort study (*n*=250) about the pattern of substance use disorder (SUD) in the United Arab Emirates. In the cohort studied, SUD correlated with smoking and marital status. Poly-substance users formed the majority of the cohort (84.4 %) with various combinations of substances identified across different age groups. Opioid and alcohol were the most common substances used. The use of pharmaceutical opioids, primarily Tramadol (67.2 % of opioid users), was higher among the youngest age group studied (<30 years old), while older opioid users (≥30 years old) commonly used illicit opioids (Heroin). The use of prescribed medication for non-medical use also included Pregabalin (mean of 8.3 capsules ± 0.5 per day), Procyclidin (6.1 tablets + 0.6 per day) and Carisoprodol (4.2 tablets ± 0.4 per day) and was again highest in the age group below 30 years (Alblooshi, 2015).

Other limited studies from the UAE which dealt with Substance Use Disorders (SUDs), suggested that dramatic social changes could be contributing factors for the increase in drug abuse amongst the Emirati population. Substance Use Disorders (SUDs) are known to cause significant mortality and morbidity. Proper data about drug abuse in the UAE and the extent and magnitude of health effects are not available (Younis, 1995).

Previous studies in the UAE using clinical populations (Younis and Saad, 1995) found that of 747 patients admitted to a psychiatric unit over a two-year period, 71 (9.5%) were admitted for a substance use disorder. Of these admissions, 16 (22%) used alcohol alone, 19 (26%) used heroin, 2 (2.8%) sniffed glue, 2 (2.8%) used hashish, 2 (2.8%) used prescribed psychotropic medication,

and 30 (42%) were poly-drug users. Amin's study using data derived from a psychiatric practice in the UAE showed that heroin abuse was more common than alcohol abuse (Amin, 1996).

Abou Saleh et al. (2001) conducted a household survey in the same city (Al Ain) and reported a prevalence of substance use or abuse among men of approximately 9%. No females were diagnosed with substance abuse. This study does not describe other characteristics of the respondents.

Amir (2001) found that about 42.3% of users in the UAE are addicted to more than one substance. A report by AlMarri from one of the UAE psychiatric hospitals stated that within a two-year period (1990-1991), 9.5% of its patients were admitted for SUD (AlMarri, 2009).

Amir (2001) compared patterns of substance use in the Kingdom of Saudi Arabia (KSA) and UAE with the rationale that the two countries were very similar in many ways (culture, race, language and religion). The study compared 120 male patients receiving treatment at a hospital in the KSA with 79 male patients receiving treatment for substance misuse in a correctional institution in UAE. Contrary to the similarity assumption, the researchers found marked differences. Age of onset of substance misuse problems was significantly lower in the UAE, 18.7 years compared to 22.5 years. The percentage of heroin users was higher in KSA (85% compared to 64%). A much larger percentage of users in UAE used opium (44%) compared to KSA (0.8%). In all other substance groups, the UAE sample reported significantly higher rates of use: hashish (87% in UAE compared to 25% in KSA), alcohol (55% in UAE compared to 31% in KSA), solvents (3.8% in UAE compared to 1.7% in KSA), sedatives (46.8% in UAE compared to 1.7% in KSA), stimulants (19% in UAE compared to 8.3% in KSA) and cocaine (20% in UAE compared to 0.8% in KSA). The poly-substance use pattern was also significantly higher in the UAE compared to KSA (85% compared to 35%).

Abu Madini compared data on drug treatment services in Saudi Arabia, from 1986 to1996, which showed a 25% increase in the mean number of drugs abused per individual (from 1.3 to 1.6) in that decade (Abu Madini, 2008). There was also a shift from alcohol as the sole substance of abuse to amphetamine-type stimulants in the form of fenethylline (captagon), with increasing numbers of instances of confiscations by enforcement authorities being reported by UNODC World Drug Report (UNODC, 2008). In Kuwait the number of patients admitted for addiction treatment in a treatment setting increased from 386 in 1997 to 779 in 1999. Also in Kuwait, Chaleby (1986) found a correlation between those who abused both types of substances (Alcohol and amphetamines) and more severe psychopathological illnesses. Those who primarily abused drugs were younger, mainly single, had higher levels of education, and exhibited more antisocial behavior. The alcoholics were older, had a higher divorce rate than the younger patients, and demonstrated organic illness with their psychiatric disorder (Chaleby, 1986). On the other hand, Dabas conducted a study to examine the factors associated with immediate relapse among Bahraini heroin abusers. The findings suggest that the treatment and rehabilitation unit in Bahrain should address issues of after-care after discharge to prevent relapse. (Dabas, 2001)

A study from Lebanon (Karam, 2010) provided rapid situation assessment of the use of multiple substances in diverse segments of the Lebanese population. The study indicated a growing trend for substance use problems in early adolescence that warrants close monitoring. But Hadidi in Jordan, in a study of trends in drug abuse associated fatalities between years 2000 and 2004, revealed that only 44 cases (0.76%) out of the 5789 total autopsies were attributed to drug abuse. The age of death among these 44 ranged from 20 to 60 years (mean+/-S.D. =32.7+/-7.2). More than 80% of cases were males. The reported abused substances single or in combination, were alcohol in 56.8%, morphine 36.4%, heroin 15.9%, benzodiazepines and cocaine 11.4%. (Hadidi,

2009). In Egypt, cannabis was reported as the preferred drug of choice, followed by alcohol (Hassan, 2009).

In Iran, 2006, the recent rise of heroin injection is strongly associated with HIV risk. Sharing injection instruments is a common and complex behavior among Iranian IDUs (Razzaghi, 2006).

In summary, the above literature review demonstrates that most of the available studies dealt with substance abusers in treatment or were conducted in selected population groups. Evidence for effectiveness of treatment, relapse rates, circumstances of use, and the quality of life of abusers are almost completely missing from the available literature in this region. Despite these limitations, available studies suggest an existing problem of substance use in the region which is likely to be on the increase.

Study site

The National Rehabilitation Center (NRC) is the major center in the United Arab Emirates (UAE) treating Emirati patients with substance use disorders (SUD). It was established in 2002 to serve and provide a potential path to treatment and recovery for all drug addicts.

NRC endeavors to develop its services to better cater for the community needs following the latest scientific methods of drug addiction treatment. It has also opened a new unit for female addicts in December 2016.

NRC pays much heed to education as a preemptive tool; it launched several initiatives to educate the community on drug detriments and preventive measures. Recently, NRC has established a specialized institute to train and educate people working in addiction and clinical practices and it has held some specialized training courses. NRC also conducted several academic addiction-

related research and studies presented at local and international conferences. Finally, NRC conducts national surveys to collect data on drug addiction, the findings of which are usually used to derive recommendations to minimize drug impacts in UAE.

Services delivered by NRC include treatment and rehabilitation services. Patients are seen at the NRC for treatment either voluntarily (self-referrals) or involuntarily following a requirement by the court system, police, families or an employer. Patients undergo an initial assessment by a team of professionals comprising of social workers, psychologists and psychiatrists for admission. A brief admission of up to two weeks could form part of the initial assessment. Based on the initial assessment patients are either admitted to the NRC as in-patients or referred to other centers if they have an exclusionary medical or psychiatric condition, or given advice and counseling but not admitted for inpatient service. Inpatient treatment was the only treatment setting available at the NRC until 2009 when the outpatient clinic opened. Since the opening of the outpatient services at the NRC, patients who do not need inpatient treatment are seen in the outpatient clinic.

Upon admission, all NRC inpatients have an in-depth psychiatric assessment, psychological tests, medical examination and social assessments and a comprehensive diagnosis, which helps medical personnel to prepare a treatment plan specific for each patient. During the inpatient stay, the treatment plan could include detoxification, medications and behavioral therapy in the form of individual or group therapy. Patients also undergo urine drug screening on a regular basis to ensure compliance. Upon completion of in-patient treatment patients are discharged to outpatient treatment, a halfway house to continue their treatment, discharged home, or returned to jail.

Currently, the NRC has an operational Research section along with an authorized Research Ethics Committee. The Research section seeks to: (1) provide evidence-based data that would be used to

improve the public health of UAE nationals; (2) disseminate academic knowledge through its participation in events and gatherings in UAE and abroad; and (3) catalyze addiction-based researches in collaboration with academic and public health organizations in UAE.

Study objectives:

The present study provides an Exploratory Data Analysis (EDA) of substance abusers (inpatients) seen at the NRC during the initial 10-years of operation period. It provides an opportunity to characterize substance abusers in Abu Dhabi, UAE, compare with previous studies, and explore trends over the study period. Our analyses will focus on the following aspects:

(1) Socio-demographic characteristics of abusers;

(2) Types and pattern of drug abuse;

(3) Outcome of treatment;

(4) Socioeconomic consequences of substance and alcohol abuse; and

(5) Occurrence of relapse after treatment.

Subjects and methods:

Study type**:** A clinical case series.

Study population*:* All 591 patients who visited the NRC for treatment for substance or alcohol use during the period February 2002 to August 2011 were included in the study. The NRC accepts only UAE nationals for treatment. Although nationals from all the UAE Emirates are eligible to

seek treatment at the NRC, most of the patients come from the Emirate of Abu Dhabi where the center is located. All patients treated at the center during the study period were male, as there were no facilities at the center to accommodate females at that time.

Sources of data

All data for the study were obtained from the medical records of patients admitted for treatment. A team of data collectors from the NRC and the United Arab Emirates University (UAEU), Al Ain, Abu Dhabi, was trained to abstract the medical records using a data form prepared specifically for the purpose of this study. The data form was prepared by senior researchers from the NRC and the departments of public health and psychiatry at the University. Data collectors were students from the medical school and researchers from NRC. Data collection was carried out under strict confidentiality and personal identifying information was not collected. This effort was carried out as a joint project between the NRC and the UAEU. The data covered patient records for the period February 2002 to August 2011.

Every effort was made to obtain high quality data despite the difficulty of abstracting medical records that were not originally prepared for the purposes of this research. This was carried out through careful planning for the study and sufficient training for the data collection team.

Data management and statistical analysis

The data were initially checked for errors by performing range and logical checks on the data. Detected errors were corrected by returning to the data forms and/or the medical records as appropriate.

Frequencies and percentages of substance users by selected variables such as socio-demographic variables and type of drug abuse were obtained and tabulated. Time trends were assessed yearly. Bivariate analyses were performed with treatment outcome as the dependent variable and a number of variables as independent variables. Statistical significance was assessed using the chi-square test for categorical variables. If the chi-square test was not appropriate because of very small numbers in some of the cells, categories were collapsed to permit such analyses. Alternatively, for 2x2 contingency tables, the Fisher's exact test was used.

Results

1- Socio-demographic characteristics of patients

Data were available for 834 patient encounters of either admission for treatment or assessment collected from 591 subjects between February 2002 and August 2011. Of the 591 subjects, 36% (n=209) were only assessed (which could vary from no admission to brief admission of up to 2 weeks) while 64% (n=369) were admitted for treatment at NRC (some patients were admitted at the NRC more than once), and 13 cases were missing Table (1).

Table (1): Date of Admission or assessment (years) of encounters seen at the NRC 2002-2011 (Total)

Date of Admission (years)	Ever Admitted		Total
	Assessed only	Admitted	
2002	2	14	16
2003	3	15	18
2004	5	23	28
2005	4	28	32
2006	8	27	35
2007	9	47	56
2008	14	43	57
2009	12	48	60
2010	64	75	139
2011	88	49	137
Total	209	369	578

Socio-Demographic characteristics

All of the subjects were Emirati males aged between 16 and 66 years, with an average age of 32.4 years (SD= 9.6). Forty-two percent were married, 44% were single and 13% were divorced. Sixty-seven percent of the patients resided in the Emirate of Abu Dhabi, 9.5% in Dubai and 11.2% in Sharjah. Sixty percent of patients were unemployed and 33.2% were either employed or students. About 51% did not reach secondary education, 33% had secondary education, and 16% had a post-secondary education (Table 2).

Table (2): Socio-Demographic characteristics of patients seen at the NRC, 2002-2011

Characteristic	***n=591,%***
Marital Status	
Single	254, 43.0%
Married	243, 41.1
Separated /Divorced/ Widowed	82, 14.2
Missing	12, 2.0
Residence	
Abu Dhabi	396, 67.0%
Dubai	56, 9.5
Sharjah	66, 11.2
Ajman	27, 4.6
RAK	12, 2.0
Fujairah	8, 1.4
Umm-Al-Quwain	5, 0.8
Missing	21, 3.6
Age	
< 20	53, 9.0%
20 – 29	190, 32.1
30 – 39	187, 31.6
40 +	146, 25.3
Missing	15, 2.5

Employment Status	
Employed/Student	191, 32.3%
Unemployed	346, 58.5
Retired	37, 6.3
Missing	17, 2.9
Education	
Primary School	125, 21.2%
Middle School	158, 26.7
Secondary School	182, 30.8
Post-Secondary Undergraduate School	90, 15.2
Missing	36, 6.1

2-Patterns of Drug Use

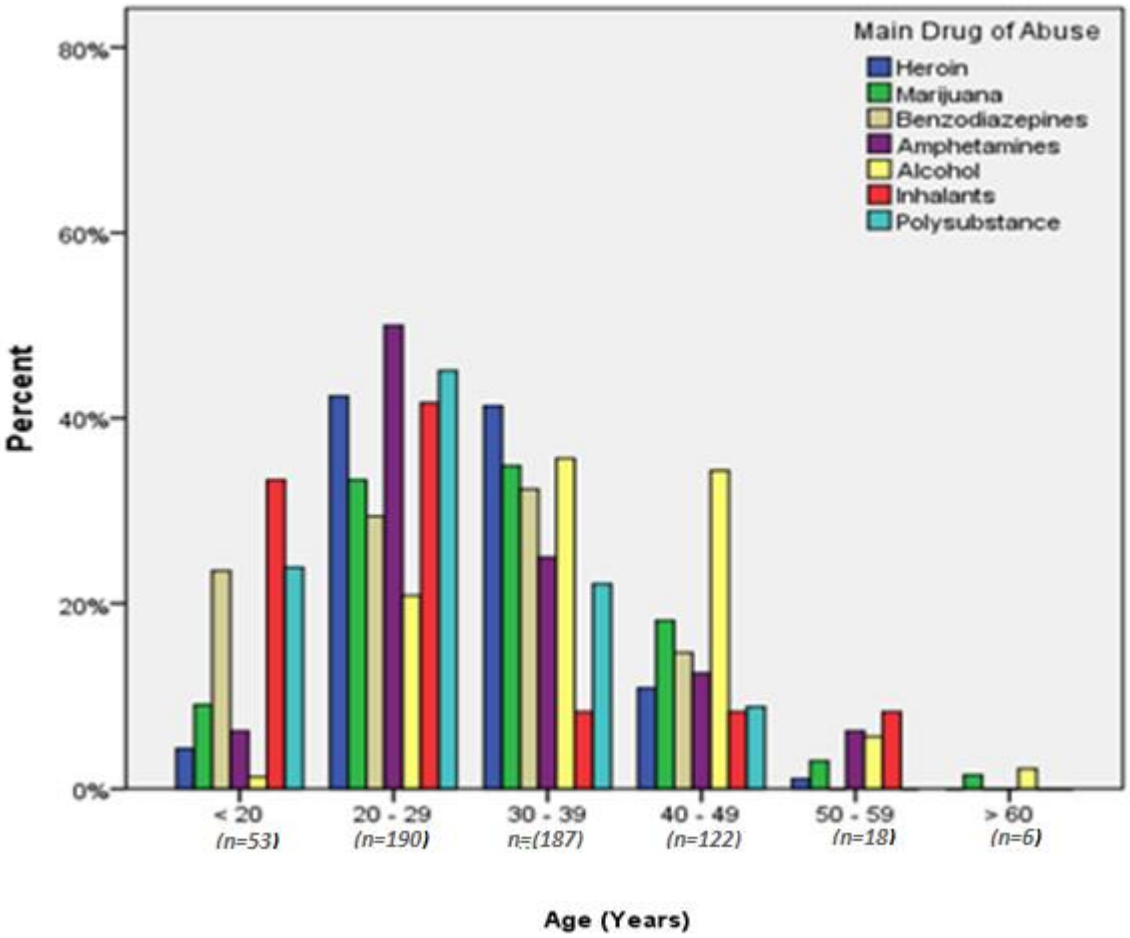
The main reported substance of abuse was alcohol in 41% (n=233). Other abused substances include heroin 16.2% (n=93), marijuana 12% (n=68), benzodiazepines 6.3% (n=36), inhalants 2.1% (n=12), amphetamines 2.8% (n=16), and other substances 20.1% (n=115) including prescription drugs, e.g., pain killers such as Tramadol, Methadone, Codeine, sedatives such as Xanax and Valium, and other poly-substances such as Kemadrine, Artane and Khat (Table 4).

Table (3): Main drug of abuse by patients seen at the NRC, 2002-2011

Main drug of abuse	Count	Percent
Heroin	93	16.2
Marijuana	68	11.9
Benzodiazepines	36	6.3
Amphetamines	16	2.8
Alcohol	233	40.7
Inhalants	12	2.1
Poly-substance	115	20.1
Total	573	100.0

Among heroin users, heroin was injected intravenously in 53.3% (n=48), snorted in 32.2% (n=29), smoked in 6.7% (n=6), and inhaled in 7.8% (n=7) of the cases, while marijuana was smoked in 95.6% (n=65) of the cases. Heroin, prescription drugs, and other drugs were more common among the younger subjects (16 to 36 years old) while alcohol was more common among the older (37 years and above) Figure (1).

Figure (1): Main Drug of Abuse of patients seen at the NRC, 2002-2011 across Age groups



Abuse of alcohol, heroin, and marijuana had also increased over time, but at a lower rate than poly-substance abuse (Figure 2). Poly-substance use (abuse of three or more substances simultaneously) had sharply increased since 2009 (Figure 2).

Figure (2): Distribution of the main drug of abuse over time, NRC 2002-2011

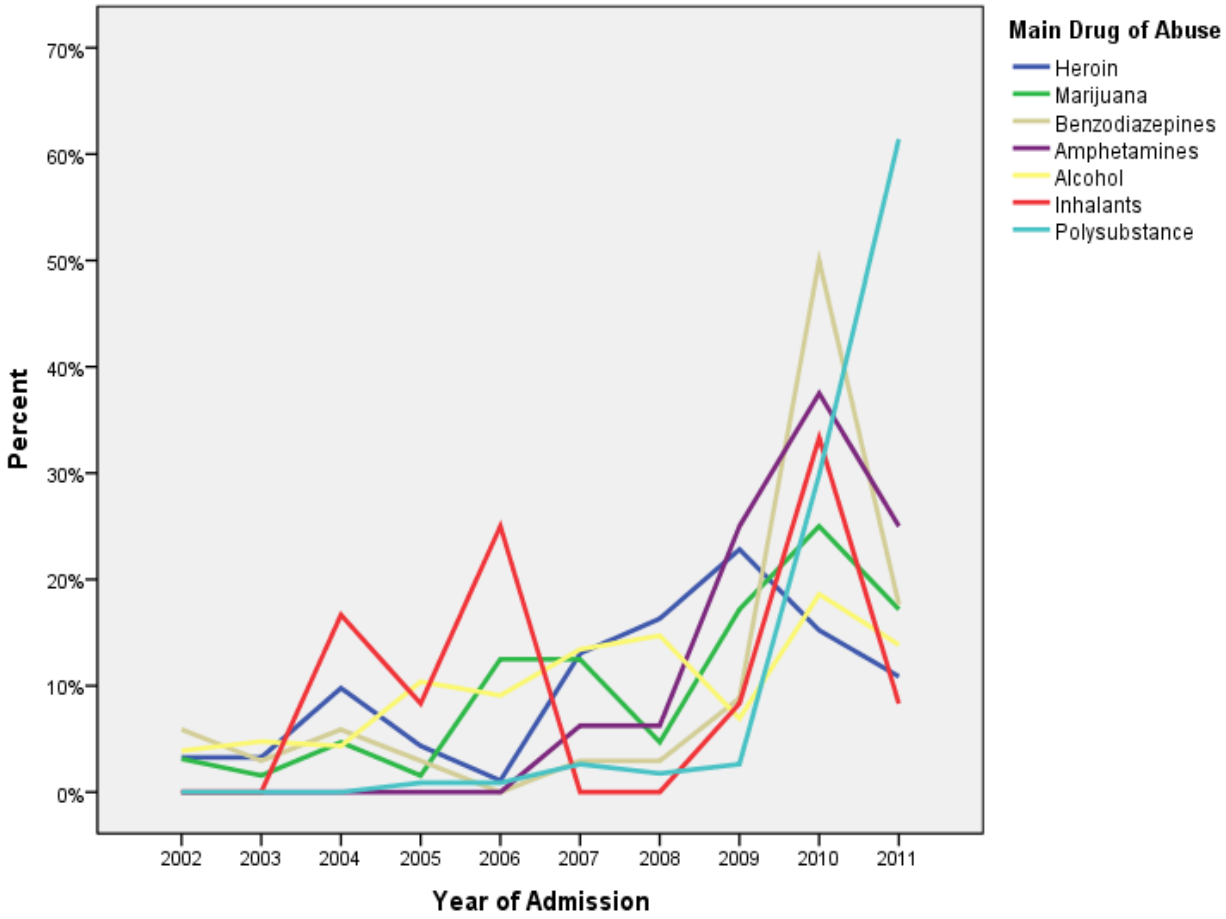


Table (4): Main Drug of Abuse over time of admission year, NRC 2002-2011

Main Drug of Abuse	Admission year (old/ recent)		Total	p-value
	2002-2007	2008-2011		
Heroin	32	60	92	<0.001
Marijuana	23	43	66	0.038
Benzodiazepines	7	27	34	0.211
Amphetamines (Stimulants)	1	15	16	<0.001
Alcohol	106	125	231	<0.001
Inhalants	6	6	12	<0.001
Psychoactive Polysubstance	5	110	115	<0.001
Total	180	386	566	

As shown in table (4), that the usage of Benzodiazepines was decreasing over the time of admission although the number of the abusers of this kind of drug increased from the early admission years to more recently. However, Marijuana and the other drugs increased more in reported usage when comparing the early and later admission years.

Table (5) Main Drug of Abuse admission year (old & recent), NRC 2002-2011

Main Drug of Abuse		Admission year (old recent)		Total
		2002-2007	2008-2011	
Heroin	Count	32	60	92
	% within admission year (old recent)	17.8%	15.5%	16.3%
Marijuana	Count	23	43	66
	% within admission year (old recent)	12.8%	11.1%	11.7%
Benzodiazepines	Count	7	27	34
	% within admission year (old recent)	3.9%	7.0%	6.0%
Amphetamines	Count	1	15	16
	% within admission year (old recent)	0.6%	3.9%	2.8%
Alcohol	Count	106	125	231
	% within admission year (old recent)	58.9%	32.4%	40.8%
Inhalants	Count	6	6	12
	% within admission year (old recent)	3.3%	1.6%	2.1%
Psychoactive Polysubstance	Count	5	110	115
	% within admission year (old recent)	2.8%	28.5%	20.3%
Total	Count	180	386	566
	% within admission year (old recent)	100.0%	100.0%	100.0%

Table (5) summarizes the change in the trend of drug usage with two different time interval, the early and the recent admission years. The two main findings were the decrease in alcohol usage to almost half, and the tremendous increase to the doubling in the psychoactive polysubstance and prescription medications.

3- Admissions and discontinuation of treatment after admission

The type of admission was compared between voluntary and involuntary admissions upon readmission to the NRC. Ninety-one percent of those who were admitted on voluntary basis at first

episode were re-admitted voluntarily in the second admission episode whereas 71% of those who were admitted on an involuntary basis in the first episode were re-admitted on a voluntary basis in the second admission.

Table (6) shows the treatment discontinuation rate by route of administration of substance use. The percentage of those who discontinued their treatment varied from about 21% to 33% depending on the route of administration of the main drug. Thirty-three percent (n=7) of those who inhaled their drugs discontinued their treatment, 26% (n=15) of intravenous drug users discontinued their treatment, and 20.7% (n=6) of those who snorted drugs discontinued their treatment. Roughly, about three fourths of patients had completed their treatment or were still on treatment (73.3%).

Table (6): Discontinuation of treatment by route of administration of main drug, NRC 2002-2011

	Discharge plan	
Route of Administration	**Treatment completed/continued (count) (percent)**	**Treatment discontinued (count) (percent)**
Oral	220 71.9	86 28.1
Smoked	45 78.9	12 21.1
Inhaled	14 66.7	7 33.3
IV	41 71.3	15 267
Snorted	23 79.3	6 20.7
Total	343 73.1	126 26.9

The majority of substance abusers used the oral route (68.8%) followed by smoking (13.4%) and intravenous route (9%). Alcohol and benzodiazepines of course were exclusively abused orally. Heroin was most commonly taken intravenously (53.3%) or snorted (32.2%). Marijuana was smoked by most marijuana abusers (98.5%) (Table7).

Table (7): Main Drug of Abuse by Route of Administration, NRC 2002-2011

Main Drug of Abuse		Route of Administration					Total
		Oral	Smoked	Inhaled	IV	Snorted	
Heroin	**Count**	0(0.0%)	6(6.7%)	7(7.8%)	48(53%)	29(32.2%)	90
Marijuana	**Count**	0(0.0%)	65(98.5%)	1(1.5%)	0(0.0%)	0(0.0%)	66
Benzodiazepines	**Count**	36(100.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	36
Amphetamines	**Count**	14(87.5%)	2(12.5%)	0(0.0%)	0(0.0%)	0(0.0%)	16
Alcohol	**Count**	229(100.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	229
Inhalants	**Count**	0(0.0%)	0(0.0%)	11(91.7%)	0(0.0%)	1(8.3%)	12
Poly-substance	**Count**	105(96.3%)	2(1.8%)	0(0.0%)	2(1.8%)	0(0.0%)	109
Total	**Count**	384(68.8%)	75(13.4%)	19(3.4%)	50(9.0%)	30(5.4%)	558

4- Co-Morbid Conditions

a- Medical Infections

A total of 532 of the 591 patients were medically screened for Hepatitis B and 530 were screened for Hepatitis C. Among those screened, 3% (n=14) and 15% (n=80) patients were positive for Hepatitis B and Hepatitis C, respectively (Table 8 & 9). Amongst intravenous drug users, the prevalence of Hepatitis C was 44% compared to 11% amongst those who mainly inhaled drugs. The prevalence of Hepatitis B varied from 0% among those who snorted or took their drugs intravenously to 7% (n=7) among those who smoked their drug. HIV data were not available since HIV positivity is an exclusion criterion for NRC admittance.

Table (8): Prevalence of Hepatitis B among patients seen at NRC, 2002-2011

Main Drug of Abuse		Hepatitis B		Total
		Yes	No	
Heroin	Count	0	91	91
	% within Main Drug of Abuse	0.0%	100.0%	100.0%
Marijuana	Count	4	59	63
	% within Main Drug of Abuse	6.3%	93.7%	100.0%
Benzodiazepines	Count	0	31	31
	% within Main Drug of Abuse	0.0%	100.0%	100.0%
Amphetamines	Count	0	16	16
	% within Main Drug of Abuse	0.0%	100.0%	100.0%
Alcohol	Count	7	196	203
	% within Main Drug of Abuse	3.4%	96.6%	100.0%
Inhalants	Count	1	10	11
	% within Main Drug of Abuse	9.1%	90.9%	100.0%
Psychoactive Polysubstance	Count	1	106	107
	% within Main Drug of Abuse	0.9%	99.1%	100.0%
Total	Count	13	509	522
	% within Main Drug of Abuse	2.5%	97.5%	100.0%

***p- value=0.08, not significant.**

Table (9): Prevalence of Hepatitis C among patients seen at NRC, 2002-2011

Main Drug of Abuse		Hepatitis C		Total
		Yes	No	
Heroin	Count	34	57	91
	% within Main Drug of Abuse	37.4%	62.6%	100.0%
Marijuana	Count	9	54	63
	% within Main Drug of Abuse	14.3%	85.7%	100.0%
Benzodiazepines	Count	3	28	31
	% within Main Drug of Abuse	9.7%	90.3%	100.0%
Amphetamines	Count	0	16	16
	% within Main Drug of Abuse	0.0%	100.0%	100.0%
Alcohol	Count	22	180	202
	% within Main Drug of Abuse	10.9%	89.1%	100.0%
Inhalants	Count	0	11	11
	% within Main Drug of Abuse	0.0%	100.0%	100.0%
Psychoactive Polysubstance	Count	11	95	106
	% within Main Drug of Abuse	10.4%	89.6%	100.0%
Total	Count	79	441	520
	% within Main Drug of Abuse	15.2%	84.8%	100.0%

***p- value<0.001, significant.**

b- Psychiatric Disorders

Psychiatric disorders were grouped under three prevalent categories such as anxiety disorders, mood disorders and other psychotic disorders (Table **7**). The prevalence of co-morbid psychiatric conditions ranged from 9-25% depending on the substance of abuse. The highest prevalence of these psychiatric conditions was observed in 25% of patients with alcohol abuse, 16% in those with poly-substance abuse and 13% in Marijuana abuser

Table (10): Distribution of psychiatric disorders among substance abusers, NRC, 2002-2011

Substance Related Disorders			Psychiatric Disorder			p-value
			No	Yes	Total	
Poly-substance Disorders	No					
		Percent	75.6	24.4	100	0.008
	Yes					
		Percent	84.2	15.8	100	
Alcohol Only Disorders	No					
		Percent	83.3	16.7	100	0.014
	Yes					
		Percent	75.4	24.6	100	
Opioid Only Disorders	No					
		Percent	81.1	18.9	100	0.445
	Yes					
		Percent	100	0.0	100	
Marijuana Only Disorders	No					
		Percent	81.4	18.6	100	0.490
	Yes					
		Percent	86.7	13.3	100	
Inhalant Only Disorders	No					
		Percent	81.4	18.6	100	0.247
	Yes					
		Percent	90.9	9.1	100	
Sedative Hypnotic or Anxiolytic Only Disorders	No					
		Percent	81.8	18.2	100	0.090
	Yes					
		Percent	0.0	100	100	
Stimulant Only Related Disorders	No					
		Percent	81.5	18.5	100	0.719
	Yes					
		Percent	88.9	11.1	100	
Other Substance Only Disorders	No					
		Percent	81.5	18.5	100	0.545
	Yes					
		Percent	100	0.0	100	

5- Voluntary versus Involuntary Patients

Seventy-seven percent (n=607) of the patients were admitted voluntarily and 23% (n=182) were involuntary patients.

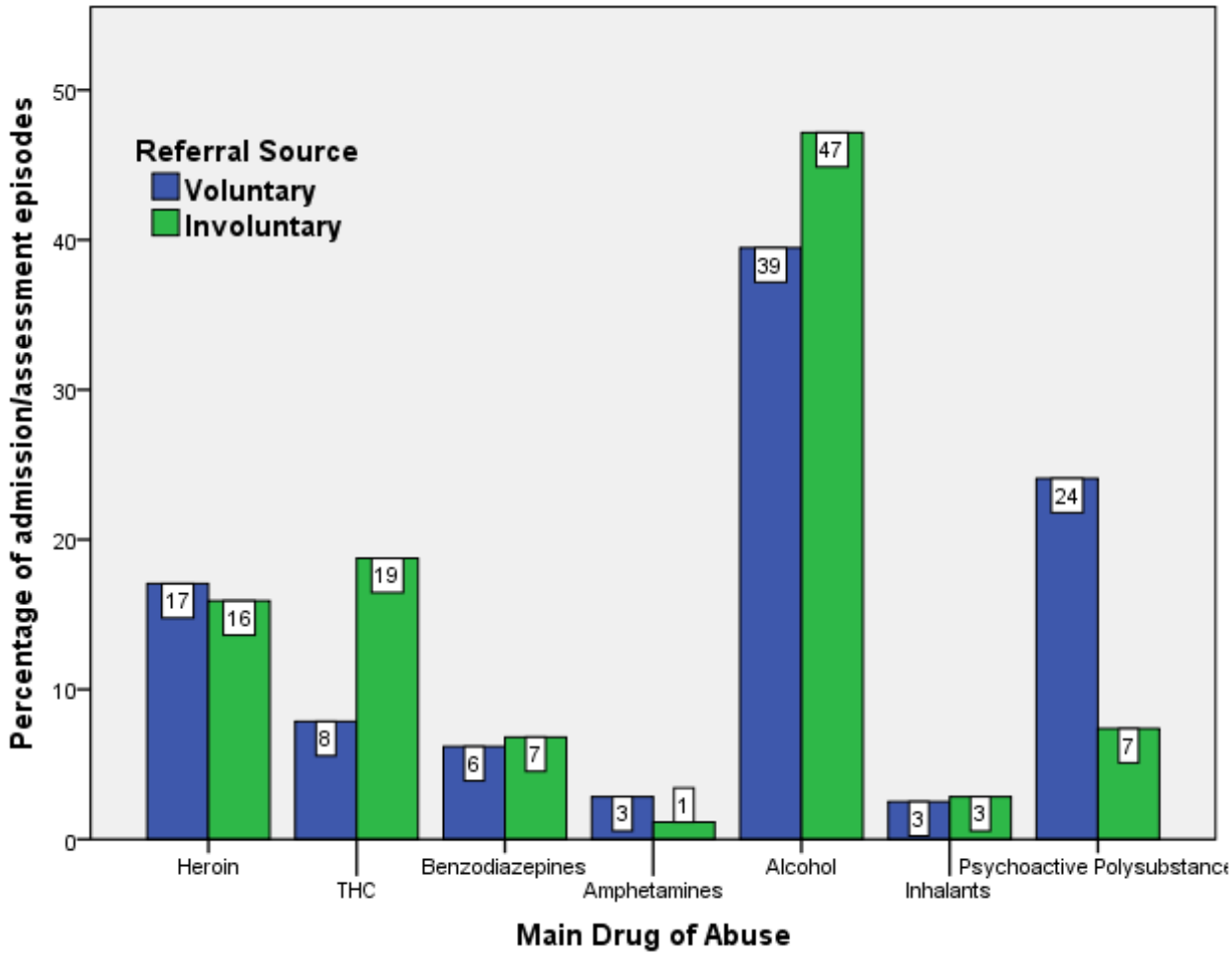
The family history report indicated that at first admission 155 (30%) of patients were from families with a history of alcohol abuse and 84 (16%) were from a family with a history of drug abuse. Depending on the patient's assessment and the treatment plan, the minimum recommended inpatient stays at the NRC ranged from 6-12 weeks.

The age distribution, marital and employment status were similar for both voluntary and involuntary patients. The mean (standard deviation) age of voluntary and involuntary referrals were, 32.0 (9.5) years and 33.6 (10.3) years, respectively (p-value = 0.085). Similar profiles with respect to marital and employment status in the first episode were noted (p-values of = 0.902 and 0.726, respectively).

There were differences between these groups with respect to educational level with 67% of voluntary and 47% of involuntary admissions having intermediate or secondary education. However, only 14% of voluntary referrals had post-secondary education compared to 22% of involuntary patients (p=0.019).

Alcohol abuse in voluntary and involuntary admissions was 39% and 47%, respectively. Abuse of other psychoactive substances was much higher for voluntary than involuntary patients (24% and 7%, respectively). On the other hand, the percentage of abusers of Marijuana among involuntary patients was approximately double that for voluntary patients (19% and 8%, respectively).

Figure (3): Relative distributions of main drugs of abuse by type of referral, NRC, 2002-2011



Results summary

Data was collected from 591 subjects between February 2002 and August 2011, of them 38% were only assessed, while 62% were admitted for treatment. The admission trends varied between the year 2002 and 2011, increased gradually in the year 2007, reaching its peak in 2010, and drop down again in 2011. Seventy-seven percent of the patients were admitted voluntarily and 23% were involuntary patients.

All of the subjects in the study were Emirati males aged between 16 and 66 years, with an average age of 32.4 years. Majority 44% were single. Sixty-seven percent of the patients resided in the Emirate of Abu Dhabi. About Sixty percent of patients were unemployed and 51% did not reach secondary education.

The main reported substance of abuse was alcohol in 41% (which was more common among the subjects 37 years and above), followed by other substances 20.1%, including prescription drugs (which was more common among younger subjects aged between 16-36 years), and heroin 16.2% (53.3% injected intravenously).

Regarding relapse, the only available recorded data as a possible indication of a patient's relapse was the number of readmissions per patient. The NRC reports a reduction from a 60% relapse rate in 2003 to a 20% relapse rate in 2010. Half the patients who relapsed had an average duration to relapse of 159 days or more, and one quarter of the relapsed patients had an average duration to a relapse of 25 days. Oral route was associated with the highest relapse rate (29%), while, inhaling & snorting of substances were associated with the second highest rate of relapse (12.6%) and least relapse rate was seen with smoking (8.4%). However, the intravenous route showed 11% relapse rate.

Of those drug abusers, who were screened, 3%, and 15% patients were positive for Hepatitis B and Hepatitis C, respectively, and HIV data were not available since HIV positivity is an exclusion criterion for NRC admittance. On the other hand, the prevalence of co-morbid psychiatric conditions ranged from 9-25% depending on the substance of abuse. The highest prevalence of these psychiatric conditions was observed in 25% of patients with alcohol abuse, 16% in those with poly-substance abuse and 13% in Marijuana abusers.

Discussion

This was an exploratory analysis with the main goal of getting ideas of drug use patterns and trends during the 10-year period of the study in the UAE. In addition, the study provides information about some outcome measures to shed light on the effectiveness of the treatment programs at the NRC.

The socio-demographics characteristics of our study population were similar to the majority of studies done in the nearby Arabian Gulf countries. A study compared patterns of substance abuse between 120 abusers from the Kingdom of Saudi Arabia (KSA) and 79 abusers from the UAE (Amir, 2001). All participants were males. Analysis of the data revealed some similarities including age, employment, and substances prevalent among poly-substance abusers. Differences in patterns of substance abuse included age at onset, prevalence of poly-substance abuse, and substances prevalent among single-substances abusers.

The majority of our study populations were young males aged between 20-39 years (63.7%). The highest proportion of them were single (43%), and about half of them (51%) did not reach secondary school. That was similar to the results that were found in Saudi Arabia (Abu Madini, 2008), and in another study conducted in Bahrain that found that the mean age of the patients was 32.7 years, the age at which drug abuse began ranged from 12 years to 31 years, and the age range of regular use was 15-37 years. More than half of the patients were single, unemployed, unskilled laborers with secondary-school education (Dabas, 2001).

Our study results were similar to what was found in a study conducted in Kuwait; as drugs were more common among the younger subjects, alcohol was more common among older persons (Chaleby, 1986)

Information about the current status of alcohol and substance abuse in the Arabian Gulf region was reviewed by AlMarri & Oei, 2008. They reported lower consumption rates compared to western countries.

A study from Egypt described client characteristics and needs, while pointing out gaps in treatment programs that need to be filled. Identifying common characteristics of treatment clients helps to better design assessment, treatment, and rehabilitation strategies. For two years, adult inpatient clients admitted to a private Egyptian hospital were systematically assessed for substance abuse (N=324). The clients were 91.4% male and 91.9% Muslim. Families supported 48.9% of the clients. Only 19.2% of the men and one woman were married. Cannabis (93.4%), alcohol (89.7%), psychotropic medications (80.9%), and heroin (78.4%) were the most common substances used recently. Anxiety (80.1%) and depression (77.4%) were common in the clients. The study highlights mental health problems and the family context of substance abuse treatment. It also underscores the few women receiving treatment and recommended improving access and reducing harm associated with substance use.

The patterns of drug use have changed from mostly single substance abuse with alcohol, heroin and marijuana to prescription drug use and poly-substance abuse especially among those aged 16-26 years. Hafeiz in Saudi Arabia observed a similar trend in two studies conducted where 27% reported abusing more than one drug in 1992 and 37% patients using a combination of drugs in a later study in 1995 (Hafeiz, 1995).

The results of this study are consistent with these reports and also show a steady increase in the number of admissions for treatment of drug abuse along with an increase in poly-substance and prescription drug abuse particularly since 2009 when outpatient service were added.

Abuse of alcohol, heroin, and marijuana had increased over time, but at a lower rate than poly-substance abuse. Poly substance use (abuse of three or more substances simultaneously) had sharply increased since 2009. This rise may partly be attributable to an increase in the number of treatment seekers. However, largely it is related to expansion of services around that time to include the start of operating the outpatient clinic late in 2009, followed by the full opening in April 2010 as well as the opening of a half-way house, along with increased awareness through media and several active health education campaigns. The other crucial factor was the use of the systematized diagnostic criteria (DSM IV / ICD) so that the poly substance dependence diagnosis was more obvious. A change in the management team also contributed to raising the standard of services and expanding the capacity of the NRC.

The sharp increase in poly-substance users could be due to many factors. One possibility is that the increase in capacity of the NRC that took place at the time, particularly the opening of the outpatient facility which attracted different populations of substance users. Another is that this reflects a change in the trend of substance use in the UAE at the time.

In Egypt, Cannabis (93.4%), alcohol (89.7%), psychotropic medications (80.9%), and heroin (78.4%) were the most common substances used recently (Hassan, 2009).

In Jordan, a study of trends in drug abuse associated fatalities was conducted between years 2000 and 2004. The study revealed that 44 cases (0.76%) out of the 5789 total autopsies were attributed to drug abuse. The age ranged from 20 to 60 years (mean+/-S.D. =32.7+/-7.2). More than 80% of

cases were Jordanian males. The reported abused substances single or in combination, were alcohol in 56.8%, morphine 36.4%, heroin 15.9%, benzodiazepines and cocaine 11.4% (Hadidi, 2009).

A qualitative study from Southern Iran was conducted to explore the demographics of substance users in a rural area of Iran. Participants were primarily male (72/76), with a mean age of 28.4 years. The most commonly used drug was opium, followed by heroin, prescription medications, buprenorphine, and hashish. (Jafari, 2008).

Inpatient treatment was the main and only treatment available at the NRC between 2002 and 2009 when the outpatient services were added. A total of 66% of the inpatients continued to receive treatment after being discharged as outpatients. This has probably contributed to the decrease in relapses noted during recent times. The overall retention rate would suggest good compliance with the short term and long-term treatments recommended. Measures of motivation, impulsivity control and satisfaction with treatment will help elucidate factors contributing to this compliance and retention in treatment.

Involuntary admissions have remained steady for the last 10 years at around one quarter of the total admissions. However, involuntary patients have longer average stays than voluntary patients. The reason for the longer stay is that court ordered patients are usually sent to the NRC for inpatient treatment usually for six months' duration. These court orders are non-negotiable, despite the fact that patients were considered as suitable candidates for a shorter duration of treatment or for outpatient treatment. These issues with the legal system in the UAE and courts handling drug abuse cases are being discussed to avoid such shortcomings.

The 10-year relapse trends at the NRC have shown a marked drop from an initial 60% when it was first opened in 2002, to about 20% in 2010/2011. This decrease can possibly be due to patient specific treatment effects, as well as better treatment focusing on cognitive behavioral therapy and relapse prevention. Group therapy and support groups like Alcoholics Anonymous (AA) were also recently introduced in the UAE and many patients have been encouraged to join these groups after being discharged or while enrolled for outpatient treatment.

Data on re-admissions in NRC showed that 71% of the involuntary patients who were admitted for relapse sought subsequent treatment voluntarily. This could be a treatment effect from previous admissions, which has resulted in reduced criminal or anti-social activity or possibly because patients learned better ways to avoid the problem of being caught by authorities for drug abuse.

In a study exploring relapse rates in Saudi Arabia, Al-Nahedh reported that 60% of his patients were admitted more than once mainly attributing it to social stress and unemployment (Al Nahedh, 1999). Similarly, Rahim reports a hospital record of relapse rate of 59.7% with 90% occurring within the first 42 months of discharge (Rahim, 2005).

In Bahrain, a study examined the factors associated with immediate relapse among Bahraini heroin abusers (Dabas, 2001). Demographic characteristics and factors associated with immediate relapse to heroin use among 40 male Bahraini heroin abusers were studied one week after discharge from the Drug and Alcohol Rehabilitation Unit in Bahrain. The vast majority used heroin intravenously. Negative emotional states and drug-related cues were noted for the majority of the subjects as influential in their immediate relapse after discharge. Findings suggest that the treatment and rehabilitation unit in Bahrain should look into the issues of after-care.

Co-morbid conditions in the present study were lower than reported internationally. This could be due to under diagnosis or incorrect reporting of facts. Measures to standardize and improve diagnosis of mental disorders like the use of the Mini International Neuropsychiatric Interview (MINI) are being introduced at the NRC.

Infectious disease rates of hepatitis C are somewhat on the low side due to lower rates of intravenous drug use, although the rate of Hepatitis C were higher among intravenous drug abuser 44% but only 7% were found to be Hepatitis B. HIV data are not available since HIV positivity is an exclusion criterion for NRC admittance. The rate of prescription medication abuse is also on the low side, consistent with international trends. Moreover, there is a concern over diversion of Buprenorphine and more red tape as far as obtaining a license for the NRC to import and use such controlled medications.

The prevalence of co-morbid psychiatric conditions in the study was observed in 25% of patients with alcohol abuse, 16% in those with poly-substance abuse and 13% in Marijuana abusers. In comparison to another study conducted in Kuwait, those who primarily abused drugs exhibited behavior that is more antisocial. The alcoholics were demonstrating organic illness with their psychiatric illness (Chaleby, 1986).

Voluntary and involuntary admissions among the clients admitted in NRC showed that 77% were voluntary and 23% were involuntary. The age distribution, marital and employment status were similar for both voluntary and involuntary clients. There were differences between these groups with respect to education level; with 67% of voluntary patients have an intermediate or secondary education and only 47% for involuntary admissions, respectively.

The family history report indicated that at first admission 30% of clients were from families with a history of alcohol abuse and 16%were from families with a history of drug abuse. In Iran, however, over 91% of the respondents reported a history of illicit drug use in at least 1 family member (Jafari, 2008).

Many studies worldwide confirmed that 50 percent Addiction is due to genetic predisposition and 50 percent due to poor coping skills and those numbers were confirmed by other studies (Enoch & Goldman, 2001).

Children of addicts are 8 times more likely to develop an addiction. One study looked at 231 people who were diagnosed with drug or alcohol addiction, and compared them to 61 people who did not have an addiction. Then it looked at the first-degree relatives (parents, siblings, or children) of those people. It discovered that if a parent has a drug or alcohol addiction, the child had an 8 times greater chance of developing an addiction (Merikangas, 1998)

In conclusion, the present study has provided a detailed description of patients seen at the NRC during the Centre's first 10-years of operation. The information provided included socio-demographic characteristics, trends overtime, substances abused, co-morbidities, and relapse rates after treatment. An increasing trend in substance abuse is likely with a more rapid increase in poly-substance abuse. The younger age groups are the mostly affected by the problem of substance abuse and alcohol remains the main substance abused. These findings should be taken in to consideration by health care planners and all concerned parties in designing strategies to control and prevent this medical problem. Overall, the relapse rate was about 27% suggesting that patient management programs at the NRC are on the right track. The data provided by this study can be

used as a baseline to monitor future trends and progress against the potentially growing substance abuse problem in the UAE.

Strengths and limitations

The main strength of this study is that it analyzes the available dataset from the largest and only comprehensive treatment center in the UAE. It provides an indication of the size of the problem, the main drugs of abuse and the changing trends across a 10-year period. It produced a profile of the clinical population that can be used as a baseline for future comparisons. It also provided information on relapse rates that is useful to measure the effectiveness of the treatment program.

One of the main limitations of this study is that it is a retrospective study, based on data extractions from case notes and not from a clinical information system. Clinician documentation is subject to considerable variation and although there was a system to clarify ambiguous or contradictory entries, this method has many weaknesses. The other main limitation that influences the generalizability of the findings is that the data is entirely based on male Emiratis. Although it can be argued that this is a strong and representational dataset of Emirati males, the lack of female data and that 80% of the residents in the UAE are non-Emirati is a limitation in assessing the prevalence and incident rates of SUD in the UAE.

Recommendations

The study has demonstrated the need for prospective and systematic data collection as part of assessment and clinical record keeping. An electronic clinical information system should use the template that was used in data extraction of this study as its basis. Such a clinical information system then could generate regular reports on changing trends that could help develop more responsive services for patients. Such data would also be useful for policymakers to develop appropriate policies to respond to this growing problem. The observed increased trend in poly-substance use, mainly the use of prescription drugs, indicates that there is a need to educate physicians about their prescription practices. The results also show the need for a central database for prescriptions that could monitor prescribing trends.

Policy Implications and Recommendations

Despite the laws, religious prohibition and cultural unacceptability the results show that there is a substance misuse problem among the male Emirati population and is increasing. Although prevalence rates cannot be calculated from a clinical population alone and the rate is most likely to be lower than Western countries, there is still an indication of an increasing trend. It is recommended that policymakers look at the findings and shift emphasis from the current "war against drugs" approach to "prevention". The findings indicate a need for a stronger prevention approach.

It is also recommended that there is a shift in the current policy towards "harm reduction". The absence of harm-reduction services leads to negative health impacts. These include preventable

HIV, hepatitis infections associated with injecting drug use, as well as overdose deaths. Even where services do exist, the criminalization of people who use drugs acts as a significant barrier for people accessing health care.

The trend seen of increase in poly-drug use and prescription medication shows the possibility of diversion of controlled medication and poor prescribing practices. A balance must be found between access to essential medicines such as opiates for pain relief and strict enforcement of the international drug control conventions, to prevent the diversion of controlled medicines to illicit markets. It is recommended that an expert panel be established to conduct a thorough and regular review of areas where drug policy is positively or negatively impacting the population and achieve a balance. A central database for all prescriptions is also strongly recommended.

Practice Implications and Recommendations

Prevalence rates of alcohol and other drug use increase rapidly during the years from early to late adolescence, and typically peak during young adulthood. Therefore, a prevention program for adolescents must be developed and implemented in school, family, and community settings.

We are in need to implement a drug abuse prevention program delivered to entire communities typically having multiple components. These often include a school-based component, family or parenting components, along with mass media campaigns, public policy initiatives, and other types of community organization and activities. These interventions require a significant amount of resources and coordination, given the broad scope of the activities involved. Those program components are often managed by a coalition of stakeholders including parents, educators, and community leaders. Some research has shown that community-based programs that deliver a

coordinated, comprehensive message about prevention can be effective in preventing adolescent substance use.

It is important that prevention efforts remain flexible and responsive to changing trends in use. For example, the abuse of prescription and over-the-counter medications among young adults is a growing problem that requires a coordinated and comprehensive response. This is especially true because these medications are often readily accessible to teenagers, from medicine cabinets at home, either from friends or relatives, or for purchase at the local pharmacy or through the internet. Multiple stakeholders can address the issue of ready access. Parents can limit access by safeguarding medications in a secure location, keeping an inventory of medications in the home, and disposing of unused or old medications. Physicians can limit access by documenting and monitoring prescription histories and refill requests for all patients and ensuring that prescription pads are secured. Pharmacists can limit access by identifying and addressing the issue of forged prescriptions. Of course, in addition to reducing access, each of these stakeholders can play a key role in raising awareness of the dangers of abusing medications.

As we move forward, it is important to address several factors that reduce the public health impact of effective prevention programming. It is clear that more research is needed to facilitate the wide dissemination of effective prevention programs into our schools, families, and communities.

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Chapter 3: Paper 2

Factors associated with treatment outcomes at the National Rehabilitation Center (NRC) in Abu Dhabi (UAE)

Introduction

Substance misuse treatment and rehabilitation has a long history and involves a wide range of treatments and approaches. They can be broadly categorized into medical treatment and psychosocial approaches. The current model of substance misuse treatment is described as the Bio-psychosocial-spiritual model (Engel, 1980, Miller, 1998). This comprehensive model as the name suggests incorporates medical treatment (chemical and physical) for the biological component, which includes detoxification, psychological therapies including family work and social interventions. The spiritual component brings in religious and cultural context as well as elements of the 12-steps approach (Miller, 1998). Treatment evaluation research has produced evidence for the efficacy of different treatments (Miller and Moyers, 2014). Today treatment centers are expected to provide "evidence based" treatments. Treatment centers around the world provide this evidence based treatment although much of the research for the effectiveness of treatment has come from the USA and Western countries (West, 2013). Much of the research on factors associated with good treatment outcomes also comes from the same countries. There is little or no research data on treatment outcome or factors associated with good outcome from treatment centers in the Middle East. Analysis of the 10-year data from the NRC to study the factors associated with good outcomes and to explore whether the known factors in the literature.

The National Rehabilitation Centre (NRC) in Abu Dhabi is the primary rehabilitation facility that recruits UAE nationals from all seven emirates. The NRC provides pharmacotherapy, rehabilitation programs and long-term treatment management plans that are customized to the needs of patients.

The NRC treatment program consists of an assessment phase, a detoxification phase for those who require it, and a rehabilitation phase that involves evidence-based psychosocial interventions and culturally relevant spiritual approaches. Whilst always based on evidence-based approaches, like in any treatment setting, this treatment program evolved over the 10-year period. Elarabi et al (2014) describe the process of program development at the NRC to arrive at the current treatment program. Since the program has not remained constant, the outcomes cannot be regarded as due to a particular program but the treatment at the NRC as a whole.

The center also plays a role in disseminating educational material relating to a range of community oriented preventative programs. These programs target family units, children at schools, and the workplace and are promoted at general public spaces in order to instill an understanding in the community of the dangers of substance use disorder as well as to introduce the available support and care in the NRC.

Outcome measurement in substance use is a relatively new field of study. Historically there were only two outcomes of treatment, abstinence or relapse. Traditionally a single incident of use following treatment is considered a relapse. Relapse following treatment is seen as the main outcome of addiction treatment (Gossop et al., 1989). A number of researchers who argued that treatment outcomes could be more complex and much broader (McLellan, et al., 1980) challenged this view. The Addiction Severity Index or ASI (McLellan, et al., 1980) is an example of outcome

measurement instrument that takes a broader view. The literature also shows that researchers are moving away from the traditional abstinence – relapse outcome measurement in different studies often focus on different outcomes with no standard agreement. To give a few examples, studies have focused on: mortality, drug use, abstention and intentions (Gossop et al., 1989); mortality, use of services, needle sharing, HIV status, employment and marital status (Skidmore et al., 1990) and use of services, abstention, drug use, illegal behavior, employment status and client satisfaction (McAuliffe, 1990). Because of the diversity of outcome criteria, researchers moved towards measuring outcome in terms of composite domains. The ASI (McLellan et al., 1980) was the first instrument to use domains. It used seven outcome domains including drug use, alcohol use, medical problems, employment support/support status, legal problems, interpersonal problems (family and social relationships) and psychological problems. Another instrument, the Opiate Treatment Index (OTI) (Dark et al., 1991), had six domains, namely, drug use, HIV risk taking behavior, social functioning, criminality, health status and psychological adjustment. The Maudsley Addiction Profile (MAP) (Marsden et al., 1998) is the most recent composite instrument with six domains: substance use, health risk behavior, health status, psychological status, personal and social functioning and criminal behavior.

The administration of the above instruments takes time and it is difficult to use them in busy clinical settings. They are mostly used in research studies. In clinical settings, outcomes such as retention in treatment and treatment completion are commonly used. To measure outcomes systematically, standardized instruments such as the ASI or the MAP have to be administered at assessment and repeated at the end of treatment and at defined follow-up periods. Linked to outcome measurement, researchers have studied factors that are associated with good and undesirable outcomes. Some common factors have emerged as associated with better outcomes.

Early initiation of drug use, which contributes to the length of period of drug use (or duration), has been found to be associated with poorer outcomes. Generally, early initiation of drug use is associated with longer periods of drug use. Early initiation of drug use is also associated with factors such as childhood abuse, neglect, household dysfunction and parental drug use (Dube et al., 2003). An adverse childhood experience has been found to contribute to a 2-4-fold increase in likelihood of early initiation of drug use (Dube et al., 2003). In a study published in August in 2014, initiating cocaine use at a very young age is associated with persistent psychosocial problems in treatment-seeking cocaine users and overall poor response to treatment (Weiss and Petry, 2014). These findings point to the fact that early initiation of drug use is indicative of complex histories that would lead to greater severity of dependence that is associated with poorer outcome of treatment (Miller and Moyers, 2014).

Higher level of education has also been linked to better outcomes. Studies found that low literacy is associated with relapse to addiction (Xie and McHugo, 2005). A number of factors could explain this. One possibility is that higher level of education may indicate later initiation of drug use as early initiation of drug use may disrupt an individual's education. Higher level of education could also mean that the individual could benefit more from the treatment program. It could also mean that the individual has more resources to deal with the problem of drug use.

Outcome literature also shows that marital status is associated with treatment outcome. Studies show that married individuals or individuals in a stable relationship tends to show better outcome than the single or divorced (e.g., Sharif, 2011). Extra support, care, and closer monitoring are possible explanations of these findings.

Literature also shows that employed individuals have better outcomes and unemployment was one of the main factors associated with relapse or poorer outcomes (Moos and Moos, 2006). This again could indicate that the individual has more resources. Employment also gives structure and purpose to the life of the individual. Employment before coming into treatment could add further motivation for recovery.

Mental health problems have been associated with poorer outcomes (Rounsaville et al., 1987). There are a number of studies that show mental health problems are associated with poorer outcomes in substance use treatment (Rounsaville et al., 1987; Marsden et al., 2000; Grella et al., 2001; Compton et al., 2003).

Family history of substance abuse has also been associated with poor outcomes (Pickens et al., 2001; Adamson et al., 2009). However, some studies have also shown that family history was not associated with treatment outcome (e.g., Coviello et al., 2004).

The association of co-existence of psychiatric disorders and poor outcomes in addiction treatment has been known for some time (McLellan et al., 1983). Studies have consistently shown poor treatment outcomes to be associated with co-morbid disorders such as anxiety, mood disorders and psychosis (Drake et al., 1996; Compton et al., 2003).

Studies have identified many other factors to be associated with good outcome in substance abuse treatment. These include readiness to change (recognition of problem, resolving ambivalence and taking action), self-efficacy, expectation about therapy outcome, satisfaction of treatment,

perceived social support, positive emotional states, and the realization of meaning of life (Flora and Stalikas, 2013).

Generalizable (common) and non-generalizable situational factors (High Risk Situations) have been identified to be associated with poor treatment outcome or relapse (Marlatt and Gordon, 1985; Ducray, 2012).

Present study

The present study involves the analysis of data collected over a 10-year period at the NRC. For the purpose of the study, "*good outcome*" is considered one of the following:

a) Treatment completion and discharge to home, or

b) Transfer to outpatient clinic.

The "*bad outcomes*" refer to:

a) disciplinary discharge, discharge against medical advice, or

b) return to jail in case of involuntary patients, or

c) Readmission because of relapse (first relapse)

The data set used in this study was constructed by extracting data from case notes not by use of standardized instruments. Data on changes in the different domains of outcome was not systematically recorded. Data on treatment completion, attendance at outpatient clinic, discharge against medical advice, disciplinary discharge and relapse were available. Treatment completion and attendance at outpatient clinic was used as a good outcome in the data analysis.

Based on the literature and data availability, hypotheses were generated to examine the relationship between treatment outcomes and demographic characteristics of age, higher level of education,

marital status, employment, family history, mental health problems, and main drug of use. It is anticipated that associations similar to those in the existing literature will be seen (i.e., younger age at first admission, divorce, a history of mental illness (anxiety, mood and psychiatric illness) and type of drug are each associated with poor outcomes of treatment). On the other hand, higher level of education and being employed will be related to good treatment outcome.

Methods

Study population

All 591 patients who visited the NRC for treatment from substance or alcohol use during the period February 2002 to August 2011 were included in the study. The NRC accepts for treatment only UAE nationals. Although nationals from all seven of the UAE Emirates are eligible for treatment at the NRC, most of the patients actually come from the Emirate of Abu Dhabi where the Centre is located. All patients treated at the Centre during the study period were male, as there were no facilities at the center to accommodate females at that time.

Sources of data

The data used in this study was constructed by extracting data from case notes, not by use of standardized instruments. Data on changes in the different domains of outcome was not systemically recorded. Data on treatment completion, attendance at the outpatient clinic, and discharge against medical advice, disciplinary discharge and relapse were available. Treatment completion and attendance at outpatient clinic was used as a good outcome in the data analysis.

All data for this analysis were obtained from the medical records of patients. A team of data collectors from the NRC and the University of UAE, Al Ain, Abu Dhabi, was trained to abstract the medical records using a data form prepared specifically for the purpose of this study. Senior researchers prepared the data extraction form from the NRC and the departments of public health and psychiatry at the University. Data collectors were students from the medical school and researchers from NRC. Data collection was carried out under strict confidentiality and personal identifying information was not collected. This effort was carried out as a joint project between the NRC and the UAE University. The data covered patient records for the period February 2002 to August 2011.

Every effort was made to obtain high quality data despite the difficulty of abstracting medical records that were not originally prepared for the purpose of research. This was carried out through careful planning for the study and sufficient training for the data collection team.

Data analysis

The aim of the study is to explore factors associated with treatment outcome in the study population. The study is a clinical case series of substance abusers admitted to the National Rehabilitation Center (NRC), Abu Dhabi.

Table (1): List of all Dependent and Independent variables for NRC patients. Abu Dhabi, UAE (2002-2011) (*n*=591)

Variable category	Variable name	Variable type	Variable definition
1-Socio-demographic variables:	Age	Continuous and categorical, Independent variable	Age was initially collected as a continuous variable and can be categorized in different ways during data analysis. Proposed categories: <20years, 20-29, 30-39, ≥40 Reference category is ≥40
	Education	Categorical	Categories include: Illiterate, primary education (1-6 years of formal education), preparatory and secondary education (7-12 years of formal education), and higher education (> 12 years of formal education) Reference category is >12 years of education
	Marital status	Categorical	Categories include: Married, single, divorced, widowed, and separated Reference category is married.
	Place of residence in UAE	Categorical (nominal)	Abu Dhabi City, Al Ain, Dubai, Ajman, Sharjah, RAK, Fujairah, Umm- Al Qawain , ABD-Western region, others
	Employment	Categorical	Employed/student, Unemployed, Retired Reference category is retired
2-Substance use variables:	Age at first admission:		Continuous and may be categorized as <20, 20-39, and ≥ 40 years Reference category is ≥40
	Circumstances at initiation: For example, family problems, unemployment, divorce, etc.		Categorical
	Type of substance abused: Alcohol, heroin, cocaine, stimulants, medications, etc.		Categorical
	Method of intake: Snorting, injection, smoking, ingestion, etc.		Categorical
	Setting of initiation: Peers, family members, etc		Categorical: Years 2002, 2003, …2011
	Setting of initiation: Peers, family members, etc.		Categorical: <3 years, 3-6, and >6
	Year of seeking treatment at the NRC: Substance use pattern over yearly time periods will be explored.		Reference category is <3
	Years since treatment started		Categorical
	Consequences of abuse: Loss of employment, divorce, imprisonment, etc		Categorical
	Family history of drug use		Binary
	Admission status (voluntary vs. involuntary)		Binary

3-Medical	Presence of infectious diseases mainly hepatitis B and C (HIV is an exclusion diagnosis)	Binary: hepatitis B (yes/no), and hepatitis C (yes/no)
	Outcome of treatment: Complete abstinence, maintenance therapy, referral, etc	Categorical
	Relapses	Binary: (yes/no)

All the variables listed in table (1), will be treated as descriptive variables of substance abusers admitted to the NRC during the study period. Outcome of treatment and relapse will also be treated as dependent variables and their association with age and education (as independent variables) will be examined. To control for potential confounding, multivariable logistic regression analyses were performed. Potential confounding variables are used as independent variables and their relationships to treatment outcome and relapse are ascertained in bivariate analyses as well as in multivariable regression models. The data were entered and analyzed using the statistical software package (SPSS) version 23.

Model selection

Choosing the "best" regression model is as much a science as it is an art. For answering the research questions of interest, we want to include the variables that we are specifically testing along with other variables that affect the response in order to avoid biased results.

Outcome of treatment will be further dichotomized (good/bad) and used as a dependent variable in a Multivariable logistic regression analysis to identify the factors independently related to this variable after controlling for all other variables. This analysis will be repeated in order to find the most parsimonious model that best fits the data. To elaborate more on using multivariable logistic

regression for testing the hypothesis regarding the association between "good/bad treatment outcome" and "early age at first admission" as an example, the following logistic regression model is explained:

$$Y = \alpha + b_1x_1 + b_2x_2 + \ldots\ldots b_nx_n$$

Y is the In (odds) of the binary outcome of interest or dependent variable, x_1 is "age of initiation of substance use (early/late) as the independent variable of interest, and x_2 to x_n are potential confounders, for example, marital status, employment, type of substance abused, etc. b_1 is the log odds ratio of say "abstinence" for "late age of initiation" after controlling for potential confounding variables in the model, x_1 to x_n.

"Relapsing" and "divorce" and others as dependent variables will be examined in separate logistic regression models in a similar way to that described for" treatment outcome"

Results

Identifying Bivariate Associations with treatment outcome

A cross tabulation and chi-square test was performed (see table 2 below); the only statistically significant relationships with treatment outcomes were found between employment status and admission year. Mood disorders were nearly significant and main drug of abuse was weakly significant concerning good treatment outcome.

The association between the dependent variable (good treatment outcome) and independent variables such as age, education, employment family history of drug and alcohol, mental illness, main drug of abuse and admission years were not statistically significant. The associations that

were found to be highly significant was between the good treatment outcome and the admission years (p=0.03), followed by employment status (p=0.05). Another nearly significant association was found between mood disorders and good outcome (p=0.06) although there was a weak association between main drug of abuse and good treatment outcome (p=0.08).

The bivariate table also showed that younger patients at first admission (<20-39yrs) were more likely to have good treatment outcomes. The results show that single and married patients end up with better treatment outcome. Patients with higher level of education, e.g., Secondary and above, showed a higher level of good treatment outcome compared to those with lower education level. When looking at employment status (employed, student, unemployed and retired) it was found that employed drug abusers showed more good treatment outcome in comparison to unemployed patients.

With regard to family history of drug/alcohol abuse, patients with no family history of drug/alcohol abuse were more likely to have good treatment outcome compared to those with a positive history of drug/alcohol history.

Among the patients without a history of mood disorders, a higher proportion was seen of patients with good outcome versus bad outcome. Similar results were found for anxiety and psychotic disorders (table 2).

Exploring the main drug of abuse (included alcohol and other types of drugs with different routes); patients with alcohol use had better outcomes. Heroin users followed by polysubstance users did better in treatment than those with other drug problems.

Finally, the admission year in the recent years of the study from 2008-2011, showed a significant relationship with better outcome, which could be due to improvements in the diagnostic tool and improving the system in the NRC and better patient rehabilitation programs and follow up.

Table (2): The association between the dependent variable (treatment outcome) & independent variables

Variables	**Good outcome**	**Bad outcome**	**Total (*n*)**	**p-value**
Age group at admission(yrs.)				
<20	14	4	18	
20-29	94	43	137	0.64
30-39	96	32	128	
40+	55	21	76	
		100	359	
Marital Status				
Married	107	37	144	
Single	114	48	162	0.73
*Others	37	15	52	

Education Status				
Primary or less	48	21	69	0.66
Middle School	79	28	107	
Secondary School	80	34	114	
Post-secondary	43	12	55	
Employment Status				
Employed/Student	88	23	111	0.05
Unemployed	72	153	225	
Retired	15	3	18	
Family History of Drug Abuse				
Yes	48	13	61	0.34
No	201	78	279	
Family History of Alcohol abuse				
Yes	71	38	101	0.42
No	178	61	239	
Anxiety Disorders				
Yes	15	8	23	0.46
No	233	85	318	
Yes				
Mood disorders				
Yes	14	11	25	0.06
No	234	82	316	
Psychotic disorders				
Yes	10	8	18	0.10
No	238	85	323	

Main Drug of Abuse				
Heroin	54	19	73	
Marijuana	34	5	39	
Benzodiazepines	21	4	25	0.08
Amphetamines	6	4	10	
Alcohol	96	51	147	
Inhalants	5	1	6	
Polysubstance	43	14	57	
Admission year (old/recent)				
2002-2007	71	44	115	0.03
2008-2011	188	56	244	

***Others for Marital status: Divorced, Widowed/Separated**

Table (3): Unadjusted and adjusted associations for good treatment outcomes among NRC patients. Abu Dhabi, UAE (2002-2011) (n=591)

Characteristics measured	*Unadjusted* 95.0% CI Odds ratio (Lower, Upper)	p-value	*Adjusted* 95.0% CI Odds ratio (Lower, Upper)	p-value
Marital Status		0.73		0.99
Married (Reference)	1		1	
Single	1.22 (0.74 , 2.01)		0.95 (0.38,2.32)	
(separated, widowed, and divorced together)	1.17 (0.57,2.37)		095 (0.36,2.50)	
Main Drug of Abuse		0.10		0.24
Heroin (Reference)	1		1	
Marijuana	1.08 (0.48,2.40)		0.88 (.033,2.33)	
Benzodiazepine	0.45 (0.15,1.38)		0.37 (0.09, 1.44)	
Amphetamine	0.58 (0.17,1.99)		0.59 (0.15,2.34)	
Alcohol	2.048 (0.50,8.35)		1.94 (0.38,9.65)	
Inhalants	1.63 (0,82,3.26)		1.49 (0.56,3.94)	
Poly-substance	0.61 (0.06, 5.71)		0.58 (0.05,7.12)	
Employment Status		0.04		0.17
Employed/Student (reference)	1		1	
Unemployed	1.31 (.35,4.90)		0.93 (0.21,4.14)	
Retired	2.35 (.668.38)		1.74 (0.43,7.11)	
Education Status		0.65		0.97
Primary or less (reference)	1		1	
Middle School	1.56 (0.69,3.56)		0.95 (0.36,2.52)	
Secondary School	1.27 (0.58,2.75)		084 (0.34,2.11)	
Post-secondary	1.52 (0.71,3.24)		0.98 (0.40,2.39)	

Admission year (old/recent)		0.00		0.00
2002-2007	0.48 (0.29,0.77)		2.46 (1.30,4.64)	
2008-2011 (reference)	1		1	
Age group at admission(yrs.)		0.64		0.23
<20 (reference)	1		1	
20-29	0.74 (0.22,2.53)		2.79 (0.57,13.61)	
30-39	1.19 (0.64,2.22)		1.73 (0.70,4.27)	
40+	0.87 (0.45,1.66)		0.88 (0.39,1.98)	
Family History of Drug Abuse		0.29		0.58
Yes	0.69 (0.35,1.35)		0.79 (0.35,1.78)	
No (reference)	1		1	
Family History of Alcohol abuse		0.42		0.66
Yes	0.23 (0.73,2.06)		1.15 (0.60,2.18)	
No(reference)	1		1	
Anxiety Disorders		0.40		0.55
Yes	0.68 (0.28,1.67)		1.42 (0.43,4,64)	
No (reference)	1		1	
Mood Disorders		0.05		0.22
Yes	0.44 (0.19,1.02)		0.53 (0.19,1.46)	
No (reference)	1		1	
Psychotic Disorders		0.10		0.15
Yes	0.44 (0.17,1.16)		0.42 (0.13,1.38	
No (reference)	1		1	

Multivariate logistic regression

Table (3) shows the results of multiple regression analysis of risk factors for relapses. Adjusting for outcomes, those who reported to have been admitted in the recent years between 2007 until 2011, had lower risk of relapse, and this remained significant after adjustment. While employment status was significant in univariate analysis, it becomes insignificant after adjustment, similarly to mood disorders.

Discussion

The study analyzed factors associated with outcomes according to seven hypotheses based on the literature. Only statistically significant relationships with treatment outcomes were found between employment status and admission year. Mood disorders were nearly significant and main drug of abuse was weakly significant concerning good treatment outcome.

Examining each of the hypotheses in detail, the first hypothesis predicted that early age of initiation of substance use (measured by the age at the first admission) would be associated with poor outcome. The results showed that there was no significant association. This finding goes against what has been generally found in the literature (Dube et al 2003. Miller and Moyers, 2014. A possible explanation for the finding is that actual data on the initiation of substance use was not available in the data set and the age of first admission was used as a proxy indicator of age of first use. The results show no significant association between early age of admission and outcome.

Future research should collect direct information on the age of initiation to establish whether it is associated with poor outcome in this population.

No significant associations were found between the levels of education and treatment outcomes. This finding goes against what is generally found in the literature (Xie and McHugo, 2005). The level of education may be inconsistently associated with outcome in different populations in different ways. Low level of education could mean early initiation into drug use, emotional difficulties and economic hardships or a combination of these factors. It has been also argued that a higher level of education could help patients get more out of the treatment programs. The NRC data shows that the majority of NRC patients had completed middle, secondary and post-secondary education.

No association was found between marital status and outcome. This finding goes against what has been consistently found in the literature (Sharif, 2011). The number of divorced patients 13% in the dataset was comparable with the available national data for men. The rate for UAE nationals from Abu Dhabi in 2010 was 14.2 (Wesbster, 2012) that indicates that divorce is an issue with this population. Perhaps what the results may indicate is that family support (patient's parents, brothers and sisters) continues and this compensates and is different from isolation that is found in other cultures. It is also possible that the criteria used in this study for defining outcome do not capture longer-term outcome data that studies in the literature use.

A significant association was found between employment and treatment outcome, which is same to what is found in the literature (Moos and Moos, 2006).

No association was found between family history of addiction and treatment outcome. The literature on family history and outcome is not consistent. Our finding is consistent with the

findings of Coviello et al., 2004. In countries with low incidence and prevalence of substance misuse and where substance use is culturally not acceptable, it would be expected that family histories would also be less prevalent.

The data was analyzed according to the diagnosis of major psychiatric disorders that was available in the data. A nearly significant association was found between mood disorder and poor outcome. The association between anxiety, psychotic disorders and poor outcomes approached but did not attain statistical significance. The significant association with mood disorders (mainly depression) is consistent with the literature (McLellan et al., 1983; Drake et al., 1996; Compton et al., 2003).

The analysis of the main drug of abuse and outcome also showed a weakly significant association. Alcohol use and heroin use followed by polysubstance (prescribed medication) was associated with poor outcome compared to other substances of abuse.

A significant association was found between year of admission and treatment outcome in the recent years of the study from 2008-2011, as the results showed a significant relationship with better outcome, which could be due to improvements in the diagnostic tool, improving the system in the NRC and better patient rehabilitation programs, and follow up.

The analysis focused on the end of a treatment episode as a time point for outcome assessment. Most studies in the literature look at outcomes over a longer period. The available dataset did not capture longer-term outcome data with set outcome criteria using in standardized instruments such as the ASI (McLellan et al., 1980). This is a major weakness of the analysis and the study. What it does show is the importance of collecting such data routinely so that proper outcomes can be evaluated. Because of this weakness it is not possible to draw any firm conclusions about the findings to say that common associations found in the literature are not found in this population.

Strengths and limitations

The strength of this study is that it is one of the first attempts to examine factors associated with treatment outcomes in the UAE. In doing so it has pointed to specific data that we should be collecting in future to measure this.

The main limitation of this study was that no standard instrument was used to measure outcomes and the outcome used was derived from crude and simple criteria. In addition, treatment outcome was measured in the short-term, whilst studies in the literature uses follow up periods of 12 to 18 months. The ideal way to measure outcome is to administer a standard instrument and repeat it at different intervals. An example of a limitation is that a key variable the age of initiation of drug use was not measured but approximated by the age of seeking treatment.

Future recommendations

Recommendations from this study is to have in place an instrument such as the ASI that would collect data on admission, at discharge and at routine intervals after discharge by following up patients. If such a system was in place, the NRC data could be analyzed and compared with studies found in the literature. Such an instrument could be added to the electronic patient note system at the NRC. If this study leads to such a system put in place it would make this a very useful contribution. If predicted associations or new associations are found in this population, it should help tailor treatment programs to suit the patients. This would be the main benefit of this type of research.

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Chapter 4: Paper 3

Predictors of relapse in the National Rehabilitation Center (NRC) patient population, United Arab Emirates

Introduction

Drug abuse is a lifestyle disease and a chronic and enduring phenomenon, which is among the most challenging and costly of public health problems, leading to physical and psychiatric outcomes in persons, families and communities (Kassini, 2015).

Relapse is seen as the most common outcome of addiction treatment (Marlatt and Gordon, 1985; Gossop et al., 1989; Walton, 2003; Xie, 2005). Much research has been carried out to look at the phenomenon of relapse, including evaluation of different interventions to reduce relapse. Evidence suggests that many factors are associated with relapse and these have led to explanatory models as well as interventions (e.g., Marlatt and Gordon, 1985; Annis, 1982a; Witkewitz and Marlatt, 2004). It appears that despite increased knowledge and improved interventions, relapse rates remain high (Walton, 2003; Matoo, 2009). This has led some researchers to re-conceptualize addiction as a "chronic relapsing condition" comparable to a chronic illness such as diabetes (McLellan et al., 2000).

Substance Use Disorder is one of the most prevalent behavioral health disorders in the world, and the high relapse rate adds to the disease burden. The importance of understanding relapse and finding ways of reducing relapse rates remains a high priority in the addiction treatment field.

There is a vast literature on relapse and predictors of relapse in addictions. A brief summary is presented below. There is limited data from developing countries and the Middle East region. In this paper the data from the National Rehabilitation Center (NRC) Abu Dhabi, UAE was analyzed to study the predictors of relapse in this population. Although it is possible that the same factors that predict relapse in Western countries could apply in Middle Eastern countries, given the very different cultural and the religious prohibitions, additional factors could be at play. The cultural and religious factors are taken to be reasons for the lower prevalence of drug and alcohol problems in the region compared to the West (WHO, 2014). No literature on relapse in a UAE population was found.

Literature Review

It has long been known that addictive disorders are chronic and relapsing in nature (Walton, 2003, Xie, 2005). A classic study in the field known as the RAND Study (Hunt et al., 1971) showed that relapse curves following treatment were similar for alcohol, tobacco and heroin and two-thirds of the relapses took place within ninety days following treatment. It was shown that 65% of alcohol relapses took place within thirty days following treatment and less than 20% were abstinent at 12 months following treatment. The downward curve of cumulative findings from other studies by Hunt et al. (1971) has been criticized on statistical grounds that the cumulative approach gives a negative bias to the curve (Marlatt, 1985). The statistical method of survival analysis has been suggested as a way of overcoming cumulative bias in such studies (Elandt-Johnson and Johnson, 1980; Marlatt, 1985). Nevertheless, recent studies examining relapse rates report similar rates to the older studies, suggesting that more than two-thirds of individuals' relapse within weeks to

months of initiating treatment (Sinha, 2001; Moore, 2003; Xie, 2005; Hyman, 2008; Mattoo, 2009; Smyth et al., 2010). For 1-year outcomes across alcohol, nicotine, and illicit drug abuse, studies show that more than 85% of individual's relapse and return to drug use within 1 year of treatment (Xie, 2005). Moore et al., 2003, have reported that 71% who achieved 2 weeks of continuous abstinence during outpatient treatment for marijuana dependence relapsed to marijuana use within 6 months. Smyth et al., 2010), have reported a 91% relapse rate.

A large proportion of individuals who have been treated for addiction tends to re-use the drug shortly after treatment ends (Sinha, 2001; Moore, 2003; Walton, 2003; Xie, 2005; Hyman, 2008; Mattoo, 2009; Smyth et al., 2010). This is a major challenge facing the field and been a subject of much research. The patient's anticipation of a positive outcome from using cocaine is likely to provide a sensitive index of cocaine relapse susceptibility. However, fear of social and clinical consequences could influence accurate reporting of cocaine craving and intent to use cocaine (Sinha, 2001).

In 2009, Mattoo published a study that examined the association between demographic variables, clinical parameters and certain psychosocial factors and relapse among patients with either alcohol or opioid dependence. Thorough structured assessments of clinical/demographic parameters, relapse precipitants, coping strategies, self-efficacy, stressful life events and perceived social support were carried out among patients with alcohol/opioid dependence who had relapsed and compared with those who remained abstinent. Similar comparisons were also carried out between relapsed and abstinent patients in the individual subgroups of alcohol and opioid dependence. Matoo found that patients who relapsed were significantly more likely (1) to have a family history of substance use and higher number of previous relapses; (2) to be using maladaptive coping strategies; (3) to have been exposed to a higher total number

of 'high risk' situations; and (4) to have experienced a higher number of undesirable life events. Those who had remained abstinent tended to significantly use a greater number of coping strategies, principally adaptive ones, and scored significantly higher on measures of self-efficacy. Factors influencing relapse appeared to be largely similar among patients with alcohol and opioid dependence. This study provided further evidence in support of the importance of certain clinical/psychosocial factors in relapse in substance dependence. It extended these results to substances other than alcohol and provided the basis for investigating correlates of relapse in a wide range of behavioral and substance use problems (Matto, 2009).

Moore's study in 2003 provided an initial examination of relapse to marijuana use among 82 individuals who achieved at least 2 weeks of abstinence during outpatient treatment for marijuana dependence. 71% used marijuana at least once within 6 months of initial abstinence, averaging 73 days until relapsing. Similarly, 71% of those who relapsed to heavier use, defined as at least 4 days of marijuana use in any 7-day period. Early lapses (at least once) were more strongly associated with consequent relapse. Previous studies have noted that marijuana-dependent outpatients experience difficulty initiating abstinence from marijuana much as do those dependent on other substances (Moore, 2003).

Early studies on relapse led to identification of what became termed High Risk Situations (HRS) (Litman et al., 1979; Cummings et al., 1980; Marlatt and Gordon, 1985). An HRS is defined as any situation that poses a threat to the individual's sense of control and increases the risk of potential relapse (Marlatt and Gordon, 1985, pp 37). This includes any situation or condition that triggers a process that increases the probability of relapse following cessation of addictive behavior and hence is predictive of relapse. These predictors of relapse have been broadly categorized into two main groups, "Intrapersonal" and

"Interpersonal" (Marlatt and Gordon, 1985). Intrapersonal predictors include negative emotional states, negative physical states, positive emotional states, testing personal control, urges, and temptations. Negative (unpleasant) emotional states, e.g., low mood, anger, frustration, anxiety, depression, boredom, is reported to account for relapses in 38% for alcoholics, 37% for smokers, 19% for heroin addicts and 47% for gamblers, (Cummings et al., 1980; Marlatt, 1985). Interpersonal determinants of relapse include interpersonal conflict, social pressure and positive emotional states. Social pressure is reported to account for 18% of relapses in alcoholics, 32% in smokers, 36% in heroin addicts and 5% in gamblers, Interpersonal conflict is reported to account for 18% of relapses in alcoholics, 15% in smokers, 14% in heroin addicts and 16% in gamblers (Cummings et al., 1980; Marlatt, 1985). The finding that negative emotional states and social pressure contributes to the majority of relapses has been replicated in later studies (Connors et al., 1996; Lowman et al., 1996). In dually diagnosed patients, baseline high levels of anxiety were predictive of relapse (Farren and McElroy, 2010).

The above classification of predictors of relapse has come to be known as "Marlatt's taxonomy", and has formed the basis of intervention approaches known as Relapse Prevention (Marlatt and Gordon, 1985, Annis, 1982a) that has been criticized by some researchers. Lowman et al (1996) concluded from a multisite replication study that the reliability of the taxonomy was variable and its predicative validity was poor. These researchers also tested an alternative taxonomy and found that it too had poor predictive validity (Stout et al., 1996; Lowman et al., 1996). One of the criticisms of Marlatt's taxonomy is that they were derived by research data relying on retrospective accounts. The replication studies reported by Lowman et al., 1996 were prospective studies, which may be more reliable.

On the other hand, a questionnaire developed in Canada, the SCQ (Annis et al., 1982b) and IDS (Annis et al., 1982a) based on the Marlatt categories was shown to have high predictive validity. Marlatt and Gordon's Cognitive Behavioral Model of Relapse (1985) centered around the concept of HRS and the interventions based on this model termed Relapse Prevention has had a major impact on the field of addictions. Whilst this model and its concepts form the basis of many rehabilitation programs around the world up until the current day, it has, also been criticized. The criticism of the model has ranged from not enough emphasis on craving and experience of withdrawal, not including motivation as a factor, not enough emphasis on outcome expectancies, inadequate emphasis on self-efficacy and coping, not accounting for the importance of social support, not accounting for diverse communities and cultural differences, and its inadequacy to explain complex cases (Mitcheson et al., 2010). Witkewitz and Marlatt (2004) introduced a new model based on mathematical modeling that takes on much of the criticisms of the old model. This model, which they call the Zen model, has yet to be established for its predictive validity.

Other predictors of relapse have been suggested by researchers. Miller et al., 1996 have suggested five theoretical domains as predictors of relapse some of which overlaps with Marlatt's. These are (1) negative life events, (2) cognitive appraisal (include self-efficacy, expectancies, motivation for change) (3) client coping resources, (4) craving experiences and (5) affect/mood status, (Miller et al., 1996; Lowman et al., 1996). It should be noted that many of these domains have been incorporated into the Witkiwotz and Marlatt (2004) model mentioned above.

Religious coping or religiosity is a neglected factor in the study of relapse. Although this is included in the client coping resources category in the Miller et al., 1996 domains, there are few studies in this area.

In a recent study, Martin et al. (2015) showed that religious coping was associated with good outcomes but did not stand out against other coping strategies. In Middle Eastern Islamic countries where there is a lower prevalence rates of substance misuse compared to Western and some Eastern countries (UNODC, 2014), religiosity could be an important factor in predicting relapse. A study carried out by the NRC in the UAE showed that religiosity was a protective factor in adolescent substance use (Alhyas et al., 2015).

The literature also shows that in terms of personality factors, impulsivity is a predictor of treatment outcome (Loree et al., 2015). These researchers found that those who scored high on measures of impulsivity pre-treatment showed poorer treatment outcomes.

Recent research has focused on biological and genetic factors as predictors of relapse (Koob and Le Moal, 2008). Craving and stress with strong biological underpinnings have been of particular interest in relation to relapse (e.g., Goeders, 2002; Koob and Kreek, 2007). Much has been discovered in the past ten years in terms of neurochemistry and neurological pathways in the brain in relation to addiction and relapse and this line of research is hopeful of developing medication to prevent relapse and improve treatment outcome (Koob et al., 2009). Electrophysiological responsivity in the brain for drug related cues has been suggested as a marker that predicts relapse in problem drinkers, with higher responsivity predicting relapse as opposed to lower responders (Petit et al., 2015). Other factor that researchers have found associated with relapse includes sleep disturbances (Brower and Perron, 2010). Although much of the research linking sleep disturbances and relapse have been done in relation to alcohol, Brower and Perron (2010) report that there is sufficient evidence to generalize these findings to other substances and hypothesizes that there are common neurobiological processes involved.

In general, the relapse literature seems to be devoid of investigations into possible contributions of cultural factors and very few papers were found on this subject from the Middle East. One study in Saudi Arabia was conducted to evaluate the long-term outcome of male patients who had completed their first detoxification/rehabilitation program in a specialized public sector facility. The study involved a case-series determination of patients re-hospitalized to calculate the 10-year relapse rate in a random sample of the first seven-year admissions (1986 - 1993) followed by a case-control comparison between the relapsing versus the non-relapsing subgroups in the 210-bed Dammam Amal Hospital which is exclusively devoted for the treatment of male substance-abusers. The treatment program consisted of a one-month detoxification/rehabilitation protocol followed by a variable period of aftercare group and support therapy using Twelve-Step Facilitation (Rahim, 2005). A sample of 504 male subjects was randomly drawn from the first 3,877 consecutive new admissions. The findings showed that the overall relapse rate was 59.7 percent. Ninety percent of relapses occurred within the first 42 months of discharge. The mean interval between discharge and relapse was 17 months, the median was 8 months and the mode was 2 months. The number of re-hospitalizations per patient over ten years ranged from 1 to 18, the mean being 3.4 relapses. Logistic regression identified nine variables conjointly predicting relapse with a sensitivity of 78 percent, specificity of 66, and overall accuracy rate of 73 percent. These were: heroin dependence, nearby residence, criminal record, unemployment, divorce, longer duration of abuse, family history of addiction, severe psychosocial stressors, and being a student (Rahim, 2005). A study from Iran showed that the results of logistic regression indicated that having a drug user in the family, being unemployed and staying connected with drug user friends after quitting were the main factors associated with relapse (Fakhar, 2012).

Prevalence data shows that substance misuse rates in Middle Eastern and Islamic countries are lower than in Western and some South Asian countries (UNODC, 2013, WHO, 2014). This indicates that there may be protective factors in the culture that impact substance use. These factors may also play a role in relapse following treatment and should be studied. The present study analyses a clinical dataset from a Middle Eastern country (UAE) using survival analysis to study factors that predict relapse in this population.

Study objectives

1- To determine the survival probabilities over different periods of follow up time, with relapse as the event of interest using Actuarial life table analysis.
2- To identify factors independently related to the relapse using Cox proportional hazard regression analysis.

Method

Study site

The National Rehabilitation Center (NRC) is the major center in the United Arab Emirates (UAE) treating patients with substance use disorders (SUD). It was established in 2002 to serve and provide hope for patients with SUD. NRC endeavors to develop its services to better cater to community needs following the latest scientific methods in drug addiction treatment. Moreover, it opened two new units for adult and female addicts recently.

NRC pays much heed to education as a preemptive tool; it launched several initiatives to educate the community on drug detriments and preventive measures. Recently, NRC has established a specialized institute to train and educate people working in addiction and clinical practices and it has held some

specialized training courses. NRC also conducts academic addiction-related research and studies, many of which have been presented in local and international conferences. Finally, NRC conducts national surveys to collect data on drug addiction, the findings of which are used to derive recommendations to minimize drug impacts in UAE.

Services delivered by NRC include treatment and rehabilitation services. Patients are seen at the NRC for treatment either voluntarily (self-referrals) or involuntarily following a requirement by the court system, police, families or an employer. Patients undergo an initial assessment by a team of professionals comprised of social workers, psychologists and psychiatrists for admission. A brief admission of up to two weeks could be the part of the initial assessment. Based on the initial assessment patients are either admitted to the NRC as in-patients or referred to other centers if they have an exclusionary medical or psychiatric condition, or given advice and counseling but not admitted for inpatient service. Since the opening of the outpatient services at the NRC, patients who do not need inpatient treatment are admitted to the outpatient services.

Inpatient treatment was the only treatment setting available at the NRC until 2009 when the male outpatient clinic opened. Admitted patients have an in-depth psychiatric assessment, psychological tests, medical examination and social assessments and a comprehensive diagnosis, which helps medical personnel to prepare a treatment plan specific for each patient. During the inpatient stay, the treatment plan could include detoxification, medications and behavioral therapy in the form of individual or group therapy. Patients also undergo urine drug screening on a regular basis to ensure compliance. Upon completion of in-patient treatment, patients are discharged to outpatient treatment, a halfway house to continue their treatment, discharged home, or returned to jail.

Currently, the National Rehabilitation Center has an operational Research Section along with an authorized Research Ethics Committee. The Research Section seeks to: firstly, provide evidence-based data that would be used to improve the public health of UAE Nationals; secondly, disseminate academic knowledge through its participation in events and gatherings in UAE and abroad; and finally, catalyze addiction-based research in collaboration with academic and public health organizations in the UAE.

Subjects and methods

Study type: A clinical case series study.

Study population

All 591 patients who visited the NRC for treatment from substance or alcohol use during the period February 2002 to August 2011 were included in the study. The NRC accepts for treatment only UAE nationals. Although nationals from all the UAE Emirates are eligible for treatment at the NRC, most of the patients actually come from the Emirate of Abu Dhabi where the Centre is located. All patients treated at the Centre during the study period were male, as there were no facilities at the center to accommodate females at that time. More details of the study population have been provided in chapter two.

Sources of data

All data for the study were obtained from the medical records of patients. A team of data collectors from the NRC and the University of UAE, Al Ain, Abu Dhabi, was trained to abstract the medical records

using a data form prepared specifically for the purpose of this study. The data form was prepared by senior researchers from the NRC and the departments of public health and psychiatry at the University. Data collectors were students from the medical school and researchers from NRC. Data collection was carried out under strict confidentiality and personal identifying information was not collected. This effort was carried out as a joint project between the NRC and the UAE University. The data covered patient records for the period February 2002 to August 2011.

Case notes were screened with a template for data collection that covered, several parameters, e.g., demographics, nature and pattern of drug use, diagnosis, educational level, referral source and discharge plans, family history of alcohol or drug misuse as well as other mental or medical co-morbidities. Every effort was made to obtain high quality data despite the difficulty of abstracting medical records that were not originally prepared for the purposes of research. The study was well planned and the case note screeners were well trained. They also had the option of consulting NRC clinical staff for clarification, particularly if there was conflicting evidence in the case notes and collecting missing data if appropriate. Random samples of half the cases were checked by a different independent researcher for accuracy.

Data management and statistical analysis

Information collected was entered into a database (Microsoft Access) and later exported to SPSS statistical package for analysis. Appropriate descriptive statistics were used to analyze and summarize the data.

We used Kaplan-Meier survival curve analysis to obtain survival probabilities for the ten years of admission with relapse and the main drug of abuse with relapse. This method assumes that patients lost to follow up or withdrawn alive at the end of the study have the same risk with respect to relapse as those remaining under observation. The second assumption is that events and losses to follow-up occur evenly within the interval. The third assumption is the absence of a cohort effect or secular trend. While the first two assumptions are likely to be true, as we have no evidence to the contrary, the third assumption is likely to be violated given the lower relapse percentages observed among the more recent cohorts. This may possibly be due to confounding by the follow-up time or, alternatively, due to an actual cohort effect related to improvement of health services overtime. To deal with this, we performed Cox proportional hazard regression in which factors, follow-up time and year of admission, were included in the model in addition to other variables of interest such as age, education, and main drug of abuse, marital status, and employment. Variables, which showed no relation to relapse, were excluded from the model. Model fit was assessed using the – 2 log likelihood.

Results

A-Bivariate analysis and Cross-tabulation

The descriptive statistics showed that our sample consists of relatively young people with an average age of 32.4 (SD= 9.6) years (ranges 16 to 66 years), and all were Emirati males. About 51% percent of

individuals in our sample did not reach secondary education, and almost sixty percent were unemployed at the time of first admission.

The most commonly reported main substance abused was alcohol at 44.7%, followed by heroin, at 20.5%. The highest relapse rate was with inhalants (55.6%) and amphetamines (37.5%); however, both were rarely the main abused substances (2.6% and 2.3%, respectively). Alcohol was associated with a high rate of relapse (32.5%) and at the same time was the most commonly abused substance representing a serious challenge to health care providers and the community at large.

Table (1) shows the relapse rates according to the main substance of abuse. It shows that the relapse rates were highest with Inhalants abusers (55.6%) and Amphetamines abusers (37.5%) followed by alcohol abusers (32.2%).

Table (1): Relapse rate by main drug of abuse, NRC 2002-2011

Main Drug of Abuse	**Relapse after admission**		**Total**
	No Relapse	**Relapse**	
Heroin	54 (75%)	18 (25.0%)	72 (20.5%)
Marijuana	30 (83.3%)	6 (16.7%)	36 (10.3%)
Benzodiazepines	17 (73.9%)	6 (26.1%)	23 (6.6%)
Amphetamines	5 (65.2%)	3 (37.5%)	8 (2.3%)
Alcohol	106 (67.5%)	51 (32.5%)	157 (44.7%)
Inhalants	4 (44.4%)	5 (55.6%)	9 (2.6%)

Poly-substance	38 (82.6%)	8 (17.4%)	46 (13.1%)
Total	254 (72.4%)	97 (26.6%)	351 (100.0%)

Table (2): Route of substance abuse and Relapse status after admission, NRC 2002-2011

Variables		**Relapse after admission**		**Total**
		No Relapse	**Relapse**	
Route of administration				
	Oral	160 (71.1%)	65 (28.9%)	225 (100%)
	Smoked	33 (80.5%)	8 (19.5%)	41 (100%)
	Inhaled	10 (58.8%)	7 (41.2%)	17 (100%)
	IV	31 (75.6%)	10 (24.4%)	41 (100%)
	Snorted	15 (75.0%)	5 (25.0%)	20 (100%)
Total		249 (72.4%)	95 (27.6%)	344 (100%)

Note: the main drug of abuse, if the patient had one substance abuse such as heroin, marijuana, alcohol, etc., he was counted once. However, if the patient had two or more substances abused he was considered as poly-substance abuse and was counted twice.

We understand that the follow up time may vary by the route of administration or type of substance abuse. Therefore, we used Cox regression analysis to account for the varying follow up times.

Table (3): Distribution of relapses according to year of admission preceding relapses, NRC 2002-2011

Date of Admission (years)	Relapse after admission		Total
	No Relapse	Relapse	
2002	5 (35.7%)	9 (64.3%)	14 (100.0%)
2003	12 (36.4%)	21 (63.6%)	33 (100.0%)
2004	22 (55.0%)	18 (45.0%)	40 (100.0%)
2005	15 (41.7%)	21 (58.3%)	36 (100%)
2006	25 (53.2%)	22 (46.8%)	47 (100.0%)
2007	48 (70.6%)	20 (29.4%)	68 (100.0%)
2008	42 (77.8%)	12 (22.2%)	54 (100.0%)
2009	52 (77.6%)	15 (22.4%)	67 (100.0%)
2010	71 (79.8%)	18 (20.2%)	89 (100.0%)
2011	60 (82.2%)	13 (17.8%)	73 (100.0%)
Total	352 (67.6%)	169 (32.4%)	521 (100.0%)

The type of admission was compared between voluntary and involuntary admissions upon readmission to the NRC. Ninety-one percent of those who were admitted on voluntary basis at first episode were re-admitted voluntarily in the second admission episode whereas 71% of those who were admitted on an involuntary basis in the first episode were re-admitted on a voluntary basis in the second admission.

B-Survival Analysis (Kaplan-Meier survival curve)

Based on a literature review it was noticed that a few researchers have specifically focused on drug abuse using survival analysis method. This present study investigated the relapse rates and patterns of drug abuse relapse and their determinant in addicts of treatment centers in the NRC using the survival analysis method. The Kaplan-Meier technique was used to estimate survival curves which track relapses over time for the whole cohort, by year of admission and by main drug of use.

Table (4): Case Processing Summary for all the admission years

Date of Admission (years)	Total N	N of Events	Censored	
			N	Percent
2002	16	8	8	50.0%
2003	18	9	9	50.0%
2004	28	7	21	75.0%
2005	32	15	17	53.1%
2006	35	9	26	74.3%
2007	56	13	43	76.8%
2008	57	8	49	86.0%
2009	60	9	51	85.0%
2010	141	12	129	91.5%
2011	137	8	129	94.2%
Overall	580	98	482	83.1%

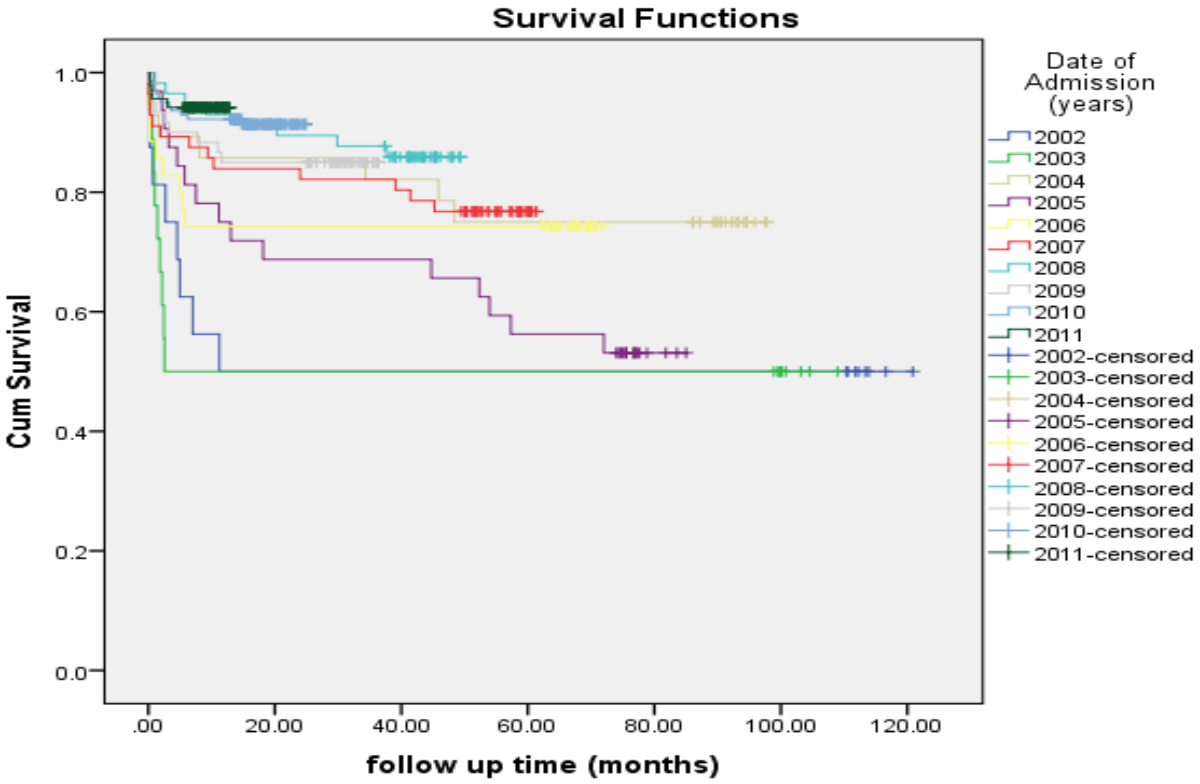
Looking to table 4, we sumarize the total number of patients in each admission year, the total number of patients who relapsed each year, in addition to the number of patients who were censored (lost to follow-up).

Table (5): Overall Comparisons for the different levels of Date of Admission (years)

	Chi-Square	df	Sig.
Log Rank (Mantel-Cox)	47.392	9	.000

Survival curve is an estimate of survival based on 10 different admission years, i.e.,10 curves for each of the 10 years. The probability of survival will become lower and lower at the end of the curve which shows the longer time of survival. The result is statistically signifecant (p<0.001 by Log Rank test) .

Figuer (1): Kaplan-Meier survival curve according to date of adnission(year), NRC 2002-2011



The log rank test included in the analysis shows that the differences in survival according to year of admission is statistically significant (p<0.001).

Table (6): Case Processing Summary for main drug of abuse

Main Drug of Abuse	Total N	N of Events	Censored	
			N	Percent
Heroin	92	18	74	80.4%
Marijuana	66	6	60	90.9%
Benzodiazepines	34	6	28	82.4%
Amphetamines	16	3	13	81.2%
Alcohol	231	51	180	77.9%
Inhalants	12	5	7	58.3%
Psychoactive Polysubstance	115	8	107	93.0%
Overall	566	97	469	82.9%

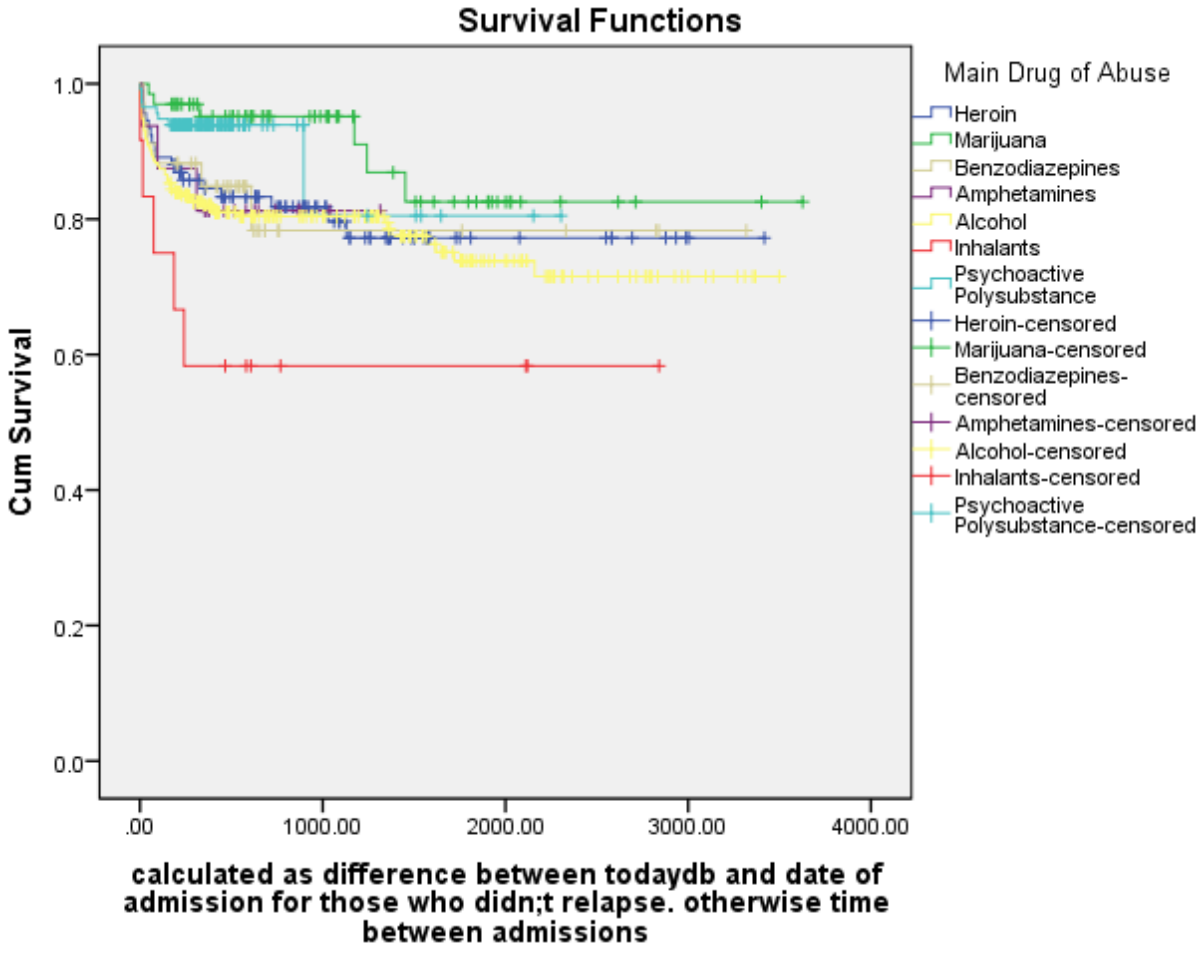
Table 6 sumarizes the total number of patients presenting with each main drug of abuse, and the total number of patients who relapsed each year, in addition to the number of patients who were censored (lost to follow-up).

Table (7): Overall Comparisons for the different levels of Date of Admission (years)

	Chi-Square	df	Sig.
Log Rank (Mantel-Cox)	15.953	6	.014

Survivals curves provide an estimate of the survival experience (i.e., not relapsing) based on the main drug of abuse, i.e., separate curves are shown for each abused drug. The probability of survival will lower over time and the end of the curve shows the longer survival. The result is statistically significant (p=0.014 by Log Rank test).

Figure (2): Kaplan-Meier survival curve according to main drug of abuse, NRC 2002-2011



The log rank test included in the analysis shows that the differences in survival according to year of admission is statistically significant (p=0.014 by Log Rank test).

When we compare the first three years (2002-2004) of relapse events across the entire cohort, we found that almost 50% of our patients in the first and second year had a relapse. Later in 2004 and 2005, it reduced to around 20% and 25%, respectively, of the total number of patients who

had a relapse. The overall relapse occurrence was seen to improve to 20% during the later years of admission (2008-2011) compared to 50% in the earlier years of admission (2002-2007).

Similarly, we compared relapse event across the entire cohort with respect to some of the most common drugs used, such as heroin, alcohol, psychoactive polysubstance and inhalants. It was found that the relapse with heroin for at least the first three years was 80%, alcohol and psychoactive polysubstance was 20% and inhalants were 50%. The reported prescribed psychoactive polysubstance abuse was seen to increase dramatically as indicated by the hazard ratio of 2.5 in the first 3 years. A similar conclusion was found here in that the relapse from various main drugs of abuse was seen to improve (reduce) among NRC patients in the more recent years of admission.

C- Cox regression analysis of relapse

Table (8): Unadjusted and adjusted Cox regression analysis of relapse among NRC patients. Abu Dhabi, UAE (2002-2011) (n=591)

Characteristics measured	***Unadjusted*** **95.0% CI**		**Adjusted** **95.0% CI**	
	Odds ratio (Lower, Upper)	**p-value**	**Odds ratio (Lower, Upper)**	**p-value**
Marital Status		0.1		0.09
Married (Reference)	1		1	
Single (separated, widowed, and divorced together)	0.56 (0.33 , 0.95) 0.59 (0.35,1.00)		0.51 (0.27,0.96) 0.52 (0.25,1.07)	
Main Drug of Abuse		0.01		0.5

Heroin (Reference)	1		1	
Marijuana	0.43 (0.17,1.10)		0.56 (0.21,1.49)	
Benzodiazepine	0.96 (0.38,2.43)		0.96 (0.34 2.65)	
Amphetamine	1.62 (0.44,5.95)		1.09 (0.32,3.72)	
Alcohol	1.11 (0.65,1.910		1.09 (0.58,2.02)	
Inhalants	2.46 (0.91,6,63)		1.36 (0.37,5.01)	
Poly-substance	0.42 (0.18,0.98)		0.51 (0.18,11.38)	
Employment Status		0.07		0.38
Employed/Student (reference)	1		1	
Unemployed	3.01 (0.71,12.61)		2.71 (0.61,12.06)	
Retired	3.64 (0.89.14.89)		2.77 (0.64,11.87)	
Education Status		0.76		0.9
Primary or less (reference)	1		1	
Middle School	1.28 (0.67,2.47)		1.18 (0.54,2.56)	
Secondary School	1.01 (0.52,1.96)		1.22 (0.57,2.64)	
Post-secondary	0.98 (0.51,1,88)		1.32 (0.62,2.80)	
Admission year (old/recent)		< 0.001		< 0.001
2002-2007	2.93 (1.92,4.49)		3.11 (1.84,5.25)	
2008-2011 (reference)	1		1	
Age group at admission(yrs.)		0.85		0.78
<20 (reference)	1		1	
20-29	1.12 (0.42,2.94)		1.94 (0.51,7.38)	
30-39	0.84 (0.50,1.43)		1.08 0.52,4.2.26)	
40+	1.02 (0.61,1.69)		1.01 (0.56,1.85)	
Family History of Drug Abuse		0.71		0.66
Yes	0.89 (0.50,1.61)		01.15 (0.60,2.20)	
No (reference)	1		1	
Family History of Alcohol abuse		0.69		0.29
Yes	0.91 (0.57,1.44)		0.75 (6.45,1.26)	
No(reference)	1		1	
Anxiety Disorders		0.33		0.5
Yes	0.70 (0.35,1.39)		1.35 (0.55,3.30)	
No (reference)	1		1	

Mood Disorders		0.49		0.76
Yes	0.79 (0.41,1.52)		0.88 (0.41,1.91)	
No (reference)	1		1	
Psychotic Disorders		0.77		0.98
Yes	0.87 (0.35,2.15)		1.01 (0.39,2.60)	
No (reference)	1		1	

Table (8) shows the result of Cox regression before and after adjustment for other confounders. In univariate analysis, only three variables showed significant associations with relapse, namely the main drug of abuse, employment and year of admission, with significant p-values equal to 0.01, 0.07, and <0.001, respectively. The odds ratio for each variable in the table is then shown after adjusting for all other variables. After adjustment only 'year of admission' remained statistically significant with a p-value equal to <0.001. Marital status remained marginally significant in the adjusted analysis with p-value equal to 0.09.

This association can be seen in the multivariate Cox regression, namely, that there was an increased risk of relapse in the early years of admission compared to the more recent years, after adjusting for other patient characteristics.

Discussion

The survival analysis showed the overall relapse occurrence was seen to improve to 20% during the later years of admission (2008-2011) compared to 50% in the earlier years of admission (2002-2007).The

relapse from various main drugs of abuse was seen to improve (reduce) among NRC patients in the recent years of admission.

The relapse rate at the NRC is consistent with studies in many parts of the world. In a ten-year prospective follow up study, Xie et al., 2005, showed that approximately one-third of clients who were in full remission relapsed in the first year, and two-thirds relapsed over the full follow-up period. Moore et al., 2003, have reported that 71% who achieved 2 weeks of continuous abstinence during outpatient treatment for marijuana dependence relapsed to marijuana use within 6 months. Furthermore, Smyth et al., 2010, reported a 91% relapse rate. The data from the present study, whilst confirming findings of other studies, also showed that the relapse rate varied from 27% to 63.8% according to the route of administration of the drug. Almost sixty-four percent (n=106) of those who used alcohol relapsed, as compared to forty-nine percent (n=17) of those who inhaled drugs, 28% (n=16) of those who used drugs intravenously relapsed, and 27% (n=7) of those who snorted drugs.

There was a decreased risk of relapse in the later years of admission compared to the earlier years, after adjusting for other patient characteristics. The hypothesis that common predictors of relapse found in the literature (e.g. positive family history; higher number of previous relapses; using maladaptive coping strategies; higher total number of 'high risk' situations; and (undesirable life events) was partially confirmed. The finding that marital status is a predictor of relapse is consistent with the literature (Kassini et al., 2015). The drug of choice predicting relapse has not been found in other studies (Xie et al., 2005). Other predictors of relapse found in the literature were not found in the study. The fact that predictors found in other studies for example age of first use (Smyth, 2010), low literacy rates (Brandon, 2007), having a drug user in the family, being unemployed and being connected to drug using friends (Fakhar, 2012) were not found possibly due to the limitation that a retrospective dataset does not directly have access to these variables. If initial data was collected using a standardized assessment instrument such as the ASI (McLellan et al., 1980) it is possible that survival analysis may have found similar results to those found in the literature. It is also possible that common predictors do not apply to this population. Before such a strong generalization could be made a prospective study that collects data using standardized instruments needs to be done. Cultural context data on factors such as religiosity that is known to be a protective factor should also be collected.

The only available recorded data as a possible indication of a patient's relapse was the number of readmissions per patient. Prior to the establishment of the outpatient services in 2009, there were no long-term follow up plans for patients who completed their inpatient treatment and were subsequently discharged. This is not a very accurate way of calculating relapse or ascertaining lapses, as the calculation was based on the number of admissions per patient from the end of a treatment session to a subsequent admission with documented drug use. Of 589 patients, 221 (38%) were not readmitted, and therefore we have no information on their use of drugs following discharge from the NRC. A total of 268 (46%) had

only one admission, 10% were admitted twice and 7% were admitted three times or more. Among the 368 admitted patients, 100 were re-admitted at least once which represents a crude relapse rate of 27.2%.

The NRC reports a reduction from a 60% relapse rate in 2003 (one year after the center opened) to a 20% relapse rate in 2010. Half the patients who relapsed had an average duration to relapse (duration between successive admissions) of 159 days or more, and one quarter of the relapsed patients had an average duration to a relapse of 25 days. The median duration stay of patients at the NRC was 64 days in the first admission, 26 days in the second admission and 37 days in the third admission. The median duration to relapse for the voluntary and involuntary patients was 106 days and 149 days respectively.

We acknowledge that, there are several aspects in this study that limit the generalizability of these findings. First, a limitation of our retrospective study is that relapse was defined as any single readmission. This may contribute to retrospective recall bias by patients, as each admission will be with a different medical chart. If recall bias was present, it would have reduced our ability to detect significant associations between relapse and the factors, which predict it. A second limitation relates to the fact that relapse is increasingly recognized as a complex product of a dynamic interaction of many more distal, intermediate, proximal and transitional factors than those relatively few factors considered by this study. The third limitation of the study is related to generalizability of findings. This can be due to the reason that demographic and socioeconomic characteristics of patients attending drug treatment centers (voluntary) might be different from those who do not refer to these centers for quitting (involuntary).

In conclusion, this study, similar to other studies, has shown factors associated with high relapse rate and determined some of its risk factors among addicts. Relapse predictive variable data needs to be collected

in the future to study those factors in more detail and to see if the pattern of relapse changes in a future survival analysis. Addiction treatment centers can collect data with the support of addict's families on their "high risk situations". These data could be very helpful in developing suitable and effective medical and psychological interventions (Hoseini, 2014; Chawla, 2009).

Limitations of our study may include misclassification biases, which could not be totally excluded because some information were not registered in the subjects' records and were collected through interview. A few researchers have specifically focused on drug abuse relapse using survival analysis, which can be considered as an advantage of the present study. In the initial treatment, it seems necessary to also supervise and monitor the treatment process through staff in addiction treatment centers with the addicts' families to reduce the relapse rate.

Addiction treatment is a complex process, dependent on demographical, environmental, psychological and therapeutic factors. The most important finding from the survival analysis of addiction relapse was the association of marital status and relapse; thus, it is necessary to be taken into account by society, policy makers and authorities in the field of addiction and conduct more detailed studies in specific family support/therapy groups of addicts under treatment.

Recommendations

In terms of practice, one of the main recommendations from these findings is that interventions should be devised in the rehabilitation program for single and divorced patients focusing on their particular high risk situations. Aftercare should also pay particular attention to the vulnerabilities of single and divorced men. These individuals should be targeted for follow-ups that are more regular so that signs of relapse could be detected early. Community and cultural based activity for single men should also be looked at.

As the use of some substances were more predictive of relapse, Relapse Prevention programs should also focus on triggers relating to particular substances and prepare individuals to deal with these through skills training.

Future research should focus on finding more comprehensive methods of tracking relapse in this population. Agreement could be obtained from individuals to be followed up, perhaps by an independent researcher on a regular basis regardless whether they are in contact with the service or not to get information on how they are doing. If they are assured of confidentiality, they may indicate whether they are using substances or not. This way a true picture of relapse following treatment could be obtained. If such a follow-up system could also obtain information on what led to their relapse if they had relapse could also gather data that could be compared with established predictors of relapse in the international literature.

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Chapter 5

Lessons learned, strengths, limitations, future directions and final thoughts

Harmful use of drugs and alcohol are a major public health problem worldwide. In fact, there is an increased concern voiced about the emergence alcohol and drug problems in the world, in general, and in the Middle East specifically. Despite numerous cultural, social, religious, and legal prohibitions against substance use and extremely punitive laws across Arabian countries, the problem of the alcohol and substance misuse exist and appears to be gradually increasing more than acknowledged, suggesting a rise in the overall number of cases.

Despite strong religious censure, cultural disapproval and the illegal nature of drug trafficking, the UAE are not insulated from the global epidemic that is substance use disorder. The increase in the prevalence of the problem can be attributed to various factors including the geographical location of the UAE. The country location borders southwest Asia, positioning it on the route between the countries that cultivate and produce illicit substances and the worldwide consumer market. Based on the 2014 world drug report, the UAE is a primary transit country for air trafficking of illicit substances, playing a key role in the global distribution of narcotics (United Nations Office on Drugs and Crime (UNODC) World Drug Report 2014. The rapid population growth and social drift are other contributing factors, primarily affecting the younger population.

The United Arab Emirates (UAE) is one of the developing countries in which drug abuse seems to be on the increase, and there is concern it could become a serious problem in the future. Many aspects of life have changed quite rapidly since the independence of the UAE in 1971. There are various opportunities for drug trafficking, given its geographical location, i.e., proximity to opiate-producing countries, long land borders and extensive international air connections.

The rapid population growth in the UAE has resulted in a predominately young population, coupled with immense social change and accompanying stressors, highlighting the importance and urgency of exploring the substance abuse situation in the country and the identification of the needs for future research both prevention and treatment.

The proliferation of the poly-substance use disorder is posing an increasing risk to public health in the UAE. There is an increasing rise in the use of pharmaceutical opioid and prescribed medications in the UAE population. With only limited information on the potential harm caused by this pattern of substance use, there will be an increase in the demand for data to describe the specific nature of these trends towards improving targeted prevention strategies with effective medical intervention

This was the reason why I chose this area of study. From a public health point of view, I wanted to establish a baseline dataset that could be used to monitor changing trends in the future. My original research questions were as follows:

1. Are drug abuse and alcohol abuse major problems in the U.A.E?
2. What are the characteristics/socio-demographic features of those clients?
3. What are the possible factors associated with the increase of drug abuse in the U.A.E.?
4. What are the factors associated with alcohol and drug abuse?

6. What types of drug are commonly reported?

7. What are the relationships between demographic characteristics such: age, ethnic group, marital status, education, living situation, job, age of initiation, etc., and the use of drugs?

8. How can we compare our data with regional and global data?

At the end of the study, I feel I have managed to answer some of the above questions and some only partially. This has been both disappointing at times but it has definitely been a learning experience. If I was to start this process again, I will certainly do some things differently. Because of the nature and limitations of the data, it was decided to analyze and present the findings in the form of three independent papers. This helped to maintain a focus and compare the findings with the available literature.

The first paper presents a descriptive analysis of the patient population, giving a profile of the male population who received treatment at the National Rehabilitation Center in Abu Dhabi over a 10-year period. The second paper looks at factors associated with good outcomes in this population. The third paper focus on factors predicting relapse in this population. Together, they provide some empirical evidence on the current issues of substance use in the UAE.

To begin to answer to the first question: Are drug abuse and alcohol abuse, major problems in the U.A.E?

It is clear from the increasing trend in admissions to the NRC that substance abuse is a growing problem. In the decade after the period of data analysis the number of referrals has more

thandoubled. To answer the question, does a major epidemiological study need to be conducted? A household survey would be the best methodology for such a study. The data from the NRC should contribute to building up a nationwide prevalence estimate. A recent situational analysis (snap shot) study carried out by the NRC should also contribute to this. The study was a joint project between the NRC and UNODC in Geneva. The study was an assessment and evaluation of the current situation of substance abuse in the UAE and its economic burden.

The answer to the second question, what are the characteristics/socio-demographic features of those clients?

The study provides data to answer this question and has made available baseline data on the Emirati male patient population. For example, the patients were aged between 16 and 66 years, with an average age of 32.4 years (SD= 9.6). Forty-two percent were married, 44% were single and 13% were divorced. Sixty percent of patients were unemployed and 33.2% were either employed or students. About 51% did not reach secondary education, 33% had secondary education, and 16% had a post-secondary education. It is now possible to compare data on an annual basis to work out trends that should help in service planning and policy development. Baseline data on a female population is now needed as there were no female patients at the NRC during the period of this study.

Regarding the third question: What are the possible factors associated with the increase of drug abuse in the U.A.E.?

It is difficult to say that the study answered this question but a change in the main drugs of abuse reported over the period under consideration indicates that different drugs become available probably because of smuggling early on. The increase in use of prescription drugs in recent years may be because of lack of awareness of physicians of the abuse potential of these drugs and the lack of a system of prescription monitoring in the UAE. What types of drug are abused?

The study was able to answer this question and chart changes in trends of drugs reportedly used. For example, the main reported substance of abuse was alcohol in 41% (n=233). Other abused substances include heroin 16.2% (n=93), marijuana 12% (n=68), benzodiazepines 6.3% (n=36), inhalants 2.1% (n=12), amphetamines 2.8% (n=16), and other substances 20.1% (n=115), including prescription drugs, e.g., pain killers such as tramadol, methadone, codeine), sedatives such as xanax and valium, and other poly-substances such as kemadrine, artane and khat.

Abuse of alcohol, heroin, and marijuana had also increased over time, but at a lower rate than poly-substance abuse. Poly-substance use (abuse of three or more substances simultaneously) had sharply increased since 2009.

What are the relationships between demographic characteristics such as age, ethnic group, marital status, education, living situation, job, age of initiation, etc., and the use of drugs?

This question was partially answered in this dissertation. For example, the outcome data showed that marital status is associated with treatment outcomes, that married individuals or individuals

in a stable relationship tend to show better outcome than the single or divorced. Extra support, care, and closer monitoring are possible explanations of these findings.

In addition, employed individuals have better outcomes and unemployment was one of the main factors associated with relapse or poor outcomes. This again could indicate that the individual has more resources. Employment also gives structure to the individual; employment before coming into treatment could add further motivation for recovery.

Mental health problems have been associated with poorer outcome. Mental health problems are associated with poorer outcomes in substance use treatment.

How do our data compare with regional and global data?

This was addressed in Chapter 2 and the data seems comparable to the available data from the region. The template derived for the data collection should form the basis of a surveillance system for the UAE and similar systems in neighboring gulf countries. The UAE is developing such a surveillance center with the leadership provided by the NRC and the WHO is promoting similar centers in the region.

Lessons learned

This study is considered as a retrospective type of study, which has clear limitations, but since there were no other data, it provided an empirical bas is to commence. We have learned many lessons from this retrospective data, and have drawn on the number of limitations, which can be dealt with in the future and can contribute for many improvements in the NRC going forward.

Effectively addressing the challenges of conducting research in a very protected society is crucial to its success. The lessons learnt from using the retrospective gathered data were beneficial and can be used to develop rich resources of further research in the area of alcohol and drug abuse in the clinical setting. With the introduction of the Electronically Medical Record, which was introduced a few years back, more rapid assessment of changes in the patient population and their risks can be assessed prospectively.

There were several challenges encountered in this study. The lack of admission of female participants until very recently only allows conclusions to be drawn on male patients. Since 95% of the patients registered with the NRC are male, it is challenging to recruit female patients. The majority of female patients in the UAE receive treatment for substance use disorder in psychiatric wards in hospitals. Future studies need to be expanded to include different recruitment strategies targeting this group of patients to allow characterization of patients of both genders with substance use disorder in the UAE.

Many lessons were learned from the process of doing this research as the following:

- How to do literatures searches
- How to do data analysis
- How to write a paper or a report?
- How to teach others to do a research study in the future

Next steps

There are a number of policy implications resulting from this study. Examining the picture of illicit drug use and physician-prescribed poly-drug use, stricter implication of the laws that exist in the country as well as developing more treatment facilities that would make treatment more accessible, are relevant policy considerations.

Reviewing policy and working toward coordinating policies with neighboring countries in the region where drug-using patterns have similarities would be useful.

Prevention campaigns and public education programs should educate the public about the dangers of substance abuse and should be targeted at young people as well as families. Messages explaining the consequences of substances use as well as religious messages are worth evaluating for their impact in reducing substance abuse and by involving all sectors in civil society.

There are a number of implications for further research from the lessons learnt and findings from the present study. Future research should select and adapt instruments based on theoretical models and more clearly defined concepts and criteria.

Future research in the UAE should consider extending the present study to a female population and to adolescents, as well as repeating it in a different treatment setting, such as the outpatient setting.

Taking the limitations of the present study into consideration, future studies should address specifically age at initiation of substance abuse, causes of substances abuse, and factors related to relapse.

Strengths

The main strength of this strength of this study is that it is the first to comprehensively explore a national male population of drug and alcohol users using retrospective data.

As the present study is the first from the UAE addressing this important problem of substance abuse, including such a large number of patients receiving treatment at the NRC allows better assessment of the situation. These data were collected in the primary center for treatment of substance abuse in Abu Dhabi and the UAE. The study collected a wide range of relevant data on this population. Data collectors were well trained and supervised by senior researchers to assure the quality of data. The present study is undoubtedly a serious undertaking to fill the gap of an almost complete lack of knowledge about substance use in UAE. Therefore, it may be a valuable resource to policy makers and prospective researchers in this field. In addition, many studies can be taken from the data collected in this study.

Limitations

There are a number of limitations of this study that should be taken into consideration to inform future studies. The study was a retrospective study, based primarily on review of clinical case notes and conducted among a treatment seeking population of substance users and those depended to care. Substance users presenting for treatment represent the tip of the iceberg and are unlikely to represent all users in a country. They are likely to represent the most severe, advanced cases.

The data are limited by the fact that this is limited to adult males, but recently the NRC opened its first female unit and it plans to open an adolescent unit. A further limitation is that there is no current data on expatriate substance use in the UAE.

In order to represent all substance users and to generate a reliable estimate of prevalence, general population-based studies theoretically should be carried out. However, such studies are difficult to perform and very likely to grossly underestimate the problem. This is evident when we consider the stigmatizing nature of the problem and the severe punishment for identified substance abusers in the country. In such a situation, self-reports are likely to be largely invalid for fear of stigma and anticipated punishments. Some researchers have attempted surveys of special population groups such as students and prisoners but the extent of underestimation is difficult to determine. In addition, the data is also limited to adult males. However, recently the NRC opened its first female unit and plans to open an adolescent unit. In addition, there no current data on expatriate drug use in the Emirates.

According to available data, there is an increase in the number of admissions for treatment of drug abuse recently along with an increase in poly-substance and prescription drug abuse particularly since 2009. Considering all the limitations listed above, this is the best available data from one of the largest and only comprehensive treatment center in the UAE.

Future Directions

In the future an electronic information system needs to be established to capture directly all the information needed for a study. A follow up with longitudinal study can be done in the future.

There are a number of implications for practice from this study. First, with the high number of prescribed medication abusers, and considering the future health burden, it is suggested that the addiction treatment program in the UAE introduce awareness and education programs for physicians and health workers to their overall programmed regarding prescription medication abuse. Addressing prescribed medications during the normal physician visit and consultation is critical to prevent iatrogenic substance dependence.

The results also showed that a large proportion of patients are now poly-drug users and had moved from one substance to another to get the same effect if one became unavailable. Treatment programs should address the issue of addiction substitution and a pharmacological education element on how substances work on the brain.

The lessons learnt and the limitations of the study should inform and contribute to improving future research in this area.

More emphasis on the prevention and education programs from drug use is required using mass media to promote awareness of prevention programs and highlighting the risks posed by old and new emerging substances. To develop Intervention strategies, targeting those young populations, this will capture a large subset of sufferers.

Finally, this study highlights the importance of examining the pattern of poly-substance use in a population in order to develop targeted prevention programs to arrest the prevailing trends. It has

drawn attention to the rise in use of prescription medication in the UAE, in particular among younger patients (<30 years), and continuing use of illicit opioid amongst males above 30 years. Specific prevention and intervention strategies targeting differences between these distinct demographic profiles will help capture a large subset of sufferers.

Curriculum Vitae

For

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Current position:

Currently working in Sheik Khalifa Medical City (SKMC), working in the CMO Office. Dealing with the following issues:

- Teaching as a Facilitator for a Service recovery model: Communicate with H.E.A.R.T (A Cleveland Clinic Program), for Health Care Providers.
- Joining the Harvard Medical School Global Clinical Scholars Research Training program (GCSRT) (2016-2016), has been selected for a SEHA Scholarship (a one year certificate program)
- Improving the outpatient specialty clinics Access
- Environmental Health & Safety (EHS) CMO representative
- Patient Experience: Physician communication training course
- The Joint Commission International Accreditation
- Follow up the study leavers
- Improving physician's documentation project
- Improving Occupation Health & Safety

Specialist Physician:

Specialist Public Health Medicine, *HAAD License No.: GD 7766*, Expiry: March 26, 2018

Maternal & Child Health Specialty

Education:

June 2011–March 2017: Doctor of Public Health degree (DrPH) Program in Health Care Policy & Management for the Emirate of Abu Dhabi.

Johns Hopkins Bloomberg School of Public Health

Baltimore – USA

July 2010-Oct.2011: PhD degree in Primary Health care. (Finish 1st year only, Pain in women area)

Centre of primary care, Aberdeen University -United Kingdom- Scotland

Nov.2008 – May.2011: Master of Public Health: Program in Health Care Management for the Emirate of Abu Dhabi

Johns Hopkins Bloomberg School of Public Health- Baltimore - USA

Nov.1997- Jan.2000: Master of public health (MPH): Maternity & Child health Specialty

School of Medicine

Jordan University of science and technology- Jordan-Irbid

Seb.1986- Jul.1993: Bachelor of Medicine, Bachelor of Surgery (MBBS)

Faculty of Medicine and health sciences-UAE University (1st batch)

Awards: SH. Rashed Award for Excellence in Educational Achievements. Jan.2001

Memberships: Emirates Medical Association.

Professional Experience:

NOV.2011-Current: worked with the Chief Medical Officer (CMO) team in Sheikh Khalifa Medical City (SKMC)

March –May 2010: Employees clinic Sheikh Khalifa Medical City (SKMC)

June 2009-March 2010: Al-Mushrf Family Medicine Clinic- Perform all the basic duties of family medicine physician.

February 2009-June 2009: Al –Nahyan MCH Center-Perform all the activities of maternity and childhood specialty which; include: Vaccination and antenatal services.

January 2000- January 2009:

MCH department Rodha clinic:

I have been appointed as MCH specialist taking care of infants and children from one month of age to two years, and providing an antenatal and postnatal medical service for women. Health education is also provided to all clients.

Jan. 2000 _ Nov.1997: Doing my Master degree in Jordan as a full time student

Nov.1997 _ Sep.1995: I joined the program of the Arab Bored for Family Physician in Al Ain medical district under the supervision of U.A.E Faculty of Medicine and Health Science. All the training and requirement was achieved.

Sep. 1995 _ Sep.1994: Working in AL Ain Medical District in the Primary Health Care Clinic.

Sep.1994_ Sep.1993: Doing the internship year in AL Ain Medical District.

Area of Interest:

- To work in the Medical Admin/Management area and help in developing the organization& improve health services.
- To focus on the main public health problems in Abu Dhabi community.
- To improve the provided public health services in Abu Dhabi.
- To study the health effect of the new changes of the UAE society.
- To study the lifestyle behavior and its effect among the local community.
- To deal with any public health related projects, and research in different area such as: addiction, social changes and drifts.
- To establish a Maternal and Child health services and research center in Abu Dhabi, and give more weight to the primary prevention program and services.

- To expand out data bank and do more researches and studies to improve public health issues in my country.

Summary:

Public health is an art and I believe in two main goals to need to be achieved; prevention before the problem is happening and reduces harm if it's already there.

I look forward to be one of the creative member in the field of medical administration and management, and to play a role as a part of a decision makers in my country to contribute to raise the health standard in my country.

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